REVIEW OF THE

TELEGRAPH AND TELEPHONE

A JOURNAL OF ELECTRICAL, SCIENTIFIC AND MECHANICAL NEWS.

Vol. 2, No. 1. NEW YORK, FEBRUARY 15, 1883. [$2.00 Per Annum Single Copies, 10 Cents.

Entered at Post Office, New York, as Mail Matter of the Second Class

In a neatly printed souvenir of the last Telephone convention at Boston, we find the following brisk parody. The writer (then a manager of the Bay State Companies but now Treasurer of three New York, New Jersey, and Pennsylvania corporations,) gave as introductory thereto a humorous sketch of the difficulties attending efforts to pronounce the title of Telephone contracts which relate to lines connecting distant points. According to our author the attempt proved fatal to one or more proof-readers and wholly so to the hero of the parody.

EXTRA-TERRITORIAL.

(Not much) After Longfellow.

I.

The shades of morn were fading fast,
As up a Berkshire hillside passed
A youth whose pocket groaned to hold
A contract, marked in letters bold,
Extra-territorial.

II.

His face was long; not so his purse,
His bank account grew daily worse;
While from his trembling lips were wrung
The accents of a twisted tongue,
Extra-territorial.

III.

His cheerful home was far below
And "disconnected" no "hello!"
Could to that station be transmitted;
Yet this shrill message he emitted:
Extra-territorial.

IV.

"Try not that route," the farmer yelled,
"No trees of mine can here be felled,
I care not for your 'right of way,'
You cannot stake this road. *Good day!*"
Extra-territorial.

V.

"O stay," a maiden said: "young chap,
Don't go a mile, but try this 'lap,'"
"That seems," the hero told his pet,
"The nicest proposition yet!"
Extra-territorial.

VI.

"No arms but 'cross-arms' now can hold
This form," (so he the maiden told.)
"Too brief my lease! When lapses this,
I'll come and try 'perpetual' bliss!"
Extra-territorial.

VII.

"Beware my shade tree's pretty branch,
Or else a law suit you may launch;"
This was th' Abuttor's fretful whine.
A voice replied, far up the line,
Extra territorial.

VIII.

At set of sun, there stiff and cold,
The youth lay "grounded," keeping hold
Of that queer contract. It were well
If some one "tol'd" The American Bell.
Extra-territorial.

IX.

There in the moonlight, clear and hot,
Rests he who was, but now is not;
Life's current from his coil escaped;
His "building" done; his "structure" draped.
Extra-territorial.

The next Continental Electrical Exhibition takes place at Vienna, this year, from August 1 to October 31, and, judging from present reports, promises to be the largest of its kind yet held. Postponed from last year to avoid clashing with the similar display at Munich, the Exhibition is being unusually well supported in a monetary sense, while the applications for space are enormous, particularly as exhibitors will pay no rent, and will only have the expense of furnishing their stalls. The Exhibition will be housed in the Rotunda and the building erected for the Universal Exhibition of 1873, and will be open both day and evening, while, though no prizes will be awarded, Messrs. Hasenstein and Vogler state that a technical and scientific commission will be organized to carry out measurements and investigations in co-operation with the exhibitors.

We learn that the Franklin Institute of Philadelphia contemplates holding an exhibition this year, which will be exclusively devoted to electricity, magnetism and their related sciences. We hope the project will not fall through for want of proper encouragement from manufaoturers, inventors and the press. Philadelphia has, through the Centennial Exposition, demonstrated her ability to conduct enterprises of this kind, and the Franklin Institute is noted for its earnest and unflagging endeavors to promote the welfare of American industries. We wish the Philadelphia Electrical Exposition every success.

The Lynn Electric Light Company, of Lynn, Mass., will occupy a new three-story brick factory to be built back of the Lynn Hotel. The establishment will produce electric lighting apparatus, and 100 men will be employed.

Mr. W. H. Preece, F.R.S., the chief electrician of the Postal Telegraph Department, delivered a lecture on this subject in the Corn Exchange, Basingstoke, England. The Exchange was beautifully lighted for the occasion by electricity, a complete small lighting plant having been fixed in position for the purpose. Mr. Preece spoke of the enormous strides which had been made in the various adaptations of electricity, and made experiments for the purpose of exhibiting the principles on which the "incandescent" and the "arc" systems of electric lighting were based. One advantage of the electric light over gas, he said, was that it consumed no air. The atmosphere remained the same. Though the light was produced by heat, it produced none; and large employers of labor found that their men could work far more comfortably under the electric light than by gas. The lecturer also referred to the extensive uses now made of the telegraph, and the telephone and other electric apparatus, and said that electricity was becoming a thing of every-day life, and the time was near at hand when it would be used to an extent that few at this moment could comprehend.

The challenge issued by Dr. E. M. Avery, of the Brush Electric Light Company, to Mr. T. C. Vance, agent of the United States Electric Light Company in Louisville, to a competitive trial of the lamps of the two companies, a forfeit of $5,000 to be paid by the loser, and the acceptance of which by the challenged party we noticed in our last issue, has come to naught, as might have been expected. The controversy was, however, continued for some days in the newspapers, and has now been reproduced entire in a circular issued by the Brush Company's representative. From this we learn that on receipt of Mr. Vance's acceptance of his challenge, Dr. Avery placed in the hands of the Polytechnic Society of Kentucky the amount of the forfeit, and wrote requesting the United States Company's representative to do likewise. The latter, however, it appears, had gone to New York, and on his return some days later declined to proceed, on the ground that the challenge required different conditions from those which had been accepted. "In our system of incandescent lighting," says Mr. Vance, replying to Dr. Avery, "as in use at present, the lamps are not placed to exceed a half-mile from the dynamos, while in your proposition you required that all lamps shall be placed at least two miles from the dynamos, and this is the loophole by which you hoped to get out. Whenever you are ready to go on with the test of our lights, as set forth over my signature in the *Courier-Journal* of the 7th inst., please call on me or address me a note to that effect."

The Polytechnic Society of Kentucky, which was to receive $4,000 from the loser in the proposed contest, is very much disappointed at this tame conclusion of the matter.

Dr. Avery publishes the following letter :

THE BRUSH ELECTRIC LIGHT CO.,
Cleveland, O., Jan. 11, 1883.

Dr. Elroy M. Avery, Louisville, Ky.

Dear Sir :—Your favor of the 10th inst., accompanied by newspaper accounts of your controversy with one Vance, is at hand. I am surprised that you have dignified these people by assuming that any comparative test of our apparatus with theirs would be proper. You are aware that, so far as the Weston arc lamp is concerned, all of its patentable features belong to the Brush Company; that it infringes no less than three of Mr. Brush's patents ; that we have already commenced and are vigorously prosecuting suits against the United States Company on these patents, and that arrangements are all completed for bringing suits against the Brenaker-Paper Company, of Louisville, which we understand is using Weston lamps. In the suit against the United States Company in New York City, after the most vigorous effort on our part, we have at last forced the United States Company to close up their testimony in defense, their last witness being examined only last week. We shall now force the case to trial, and if we win it, as we have every reason to believe we shall do, every Weston lamp now in use in this country will have to be stopped. The appealing of the case to the Supreme Court will not enable their customers to continue using these infringing lamps as the United States Company are trying to make their customers believe. After the decision in our favor by the Circuit Court of New York, the use of these lamps will be stopped and not permitted again unless the Supreme Court should reverse the decision of the Circuit Court There is not one chance in a hundred that such a decision would be reversed, and the case would not be reached by the Supreme Conrt, in any event, in less than two years.

In view of these facts, I regret that you should have taken the action you did, but as it was evidently one by you in good faith, and there is no question as to how such tests, fairly conducted, would result, we propose to stand back of you and beat them so badly that you will hear no further from them.

I presume your engagements will compel you to commence the tests at once, as you have so many other matters in hand. This you can do, as the apparatus regularly in use by our Louisville company will be all you need for the arc light tests. The incandescent lamps can meantime be obtained from the Swan Company. See that incorruptible judges are chosen, and follow the matter up with your usual energy. Yours truly,

THE BRUSH ELECTRIC CO.
By G. W. STOCKLEY, Vice-President.

"Furthermore," continues Dr. Avery, "I cannot see any impropriety in calling attention to the fact that the Cleveland Common Council, on last Thursday night, did renew the contract, at unchanged prices, with the Brush Electric Light and Power Company by the decisive vote of twenty-six to three. As an attempt to prevent any possible quibble on this subject by Professor Vance, I will add that each alternate lamp (placed on posts) on Euclid avenue is withdrawn, and that an additional high iron mast is provided for. It was held that the remaining lamps on Euclid avenue would illuminate that splendid street better than are the neighboring gas-lit streets. As a matter of fact, the present contract calls for a somewhat greater expenditure for electric lighting than did the contract of last year."

The Paris Electrical Exhibition.

A medal, commemorative of the great Electrical Exhibition at Paris in 1881, has been struck in France, and presented to all those who contributed to the success of the undertaking. The medal is very elegant, and has on one side a symbolical figure of science in the form of a goddess descending on the world out of a lightning cloud, with a torch in her right hand. On the obverse side are inscribed the names of Jules Grevy, President of the Republic, Adolph Cochery, Minister of Posts and Telegraphs, and Georges Berger, Commissioner-General. The name of the recipient is also engraved on a tablet on the same side.

Fog Lights on the Sound.

The Old Colony would not have run aground on Hart's Island if a lighthouse had been erected on Hart's Point, and if an electric light had been provided for use there in fogs, the steamboat would have been safe in the densest fog at midnight, whereas without any light she ran ashore at 8 o'clock in the morning. The government has appropriated money for a tower of electric light at Hell Gate, and the delay in applying it to its purpose may prove very costly. Provision should be made for the display of electric light in fogs at the lighthouses of all the chief points of danger on the Sound. Electric light is needed both on board vessels and at every point of danger along much frequented coasts to prevent disaster in fogs. Let the government act in this matter.

The Electric Arc in Vapor of Sulphuret of Carbon.

Jamin and Maneuvrier introduced a few drops of sulphuret of carbon into Geissler tubes, so as slightly to increase the pressure, and thus obtained a light of great brilliancy. On looking at it with smoked glass, they saw a brilliant arc resembling a horse-shoe or a capital Omega. The points of the two carbons appeared red and very brilliant ; but the arc was of pale green, and as its light surpassed that of the carbons, the whole hall was illuminated with its tint as it would have been by a copper Bengal light. The brilliancy increased with the increasing tension of the vapor, until it became intolerable ; but as the resistance increased at the same time, the arc was often extinguished, and it was necessary frequently to renew it by bringing the two carbons together. It is not likely that the light can be advantageously used, unless for light-houses or signals at a distance. *Comptes Rendus.*

INFLUENCE OF PRESSURE UPON THE CONDUCTIVE RESISTANCE OF MERCURY.—By R. Lenz.—A thermometer tube. 1.2 meter in length, was expanded at its ends in the shape of two cups, 1 c.m. in width, and filled with pure dry mercury free from air. The current was led to the cups by means of platinum hooks. The tube was placed in a piegometer in which the pressure could be raised to 60 atmospheres, and which was surrounded with ice. Two platinum wires connected the platinum hooks with the clamps of the piegometer. The resistances were measured according to Wheatstone's bridge method.

The resistance of the copper wires admitted of being neglected; that of the platinum wires, according to thickness, varied from 0.51 to 0.27. The resistance of the mercury was about 7.5 On increasing the pressure from 0 to 60 atmospheres, the resistance decreased 0.02 per cent. for each atmosphere. The decrease is approximately proportional to the pressure.

If the tube is filled in a vacuum by means of Weinhold's distillation apparatus, or by sucking in the mercury the resistance is in the first case 0.12 per cent. smaller than the latter.

METHOD OF MEASURING REACTIVE FORCES BY THE RADIATION OF ELECTICITY.—By F. Melde.—The author has published in the *Zeitschrift für Instrumenteen. Kunde* a method of which the reactive power of escaping liquids can be measured by the torsion-force of a wire, according to the well-known arrangement of Segner's water-wheel. The instrument which he has constructed admits of the performance of approximately accurate experiments.

This method of opposing the torsion of a wire to reacting forces, and thus comparing the latter with each other. or measuring them absolutely can, he finds, be very well applied to the radiation of electricity from points, as in the so-called electric fly-wheel. As it has not been attempted, to his knowledge, to measure these forces, strictly speaking, he believes that various useful results may be drawn from the method indicated.

It will scarcely be needed to refer to the various questions which may here find a solution. We may remember the influence of the nature of the points as to shape and material; the influence of the source of electricity, the means of conduction, the surrounding medium, the difference between positive and negative electricity, and we must, therefore, admit that there is here much to be determined. The author is at present engaged with the further investigation of this subject.

ON THE THERMIC PHENOMENA OF THE INDUCTION SPARK.—By A. Naccari.—A brass tube of 12 centimeters in diameter, introduced into the middle aperture of a Woolf's bottle, was closed below hemispherically; it contained 8 grms. of water and a thermometer. In a lateral aperture of the Woolf's bottle a wire was fitted by means of a cork, and terminated in a brass ball, 10.1 millimeters in diameter below the table, and at a distance of 3.5 millimeters from its lowest part.

The Woolf's bottle was exhausted, and the heating of the water in the tube, on passing the currents of an inductorium in one or the other direction, was observed by means of the intercalation of a thermometer.

The circuit had to be interrupted by an extent of air 2 mm. in length, in order that the discharges might be entirely directed in one way; otherwise the results would have been irregular.

With the decrease of pressure the heating of both electrodes diminished.

The proportion of the heating of the negative and the positive electrodes increases thereby, from 3 at the pressure of the atmosphere to 4 at a pressure of 11 millimeters of mercury. If an interruption is present in air sufficiently rarefied, the indirect induction current antagonistic to the inducing current preponderates, if the electro-motive force is sufficiently great.

In further experiments at the pressure of the atmosphere a condenser was introduced into the circuit. For this purpose the positive pole of the inductorium was connected with a ball, opposite which was placed another ball, connected with the coating of a condenser (a Leyden battery). The same coating was connected with one electrode, a hollow brass ball, 5 centimeters in diameter, filled with petroleum; whilst the other coating was in communication by means of the galvanometer with the other similar electrode, and the other pole of the inductorium.

In these experiments the proportion of the heating of the negative and positive electrode diminished with the increasing capacity of the condenser down to 1, after which changes had no effect. Up to a certain capacity the heat produced in both electrodes is differently distributed. If the capacity is greater, the heat increases to a maximum, and then declines again.

Finally, into a thin glass globe, with two small

tubulures, there were introduced two copper wires 3 millimeters in thickness, the very even end surface of which were at the distance of 7.8 millimeters from each other. The ball was placed in a calorimeter full of water (75 cubic centimeters), through which the copper wires are led, insulated. As the intensity of the current increased, the potential difference between the electrodes, derived from the heating, decreased. A condenser introduced into the circuit reduces the mean potential difference of the elec trodes the less as the capacity is greater. This potential difference derived from the heating is very much smaller than that recognized by Thomson and others at the commencement of the discharge.

HEATING OF NON-CONDUCTIVE INSULATING SOLIDS AND LIQUIDS BY ALTERNATING ELECTROSTATIC POLARIZATION.—By Maccari and Bellati.—Siemens and Righi have previously recognized such cases of heating in solid bodies. The authors fixed in a test tube a smaller one by means of a cork, and filled the interstice between the two with petroleum, into which was introduced a capillary tube. The test-tubes were coated and lined with tinfoil, and the inner one was filled with mercury. The coatings were connected with the poles of an inductorium. The petroleum was found to expand, as also benzol. If a Leyden jar was introduced into the induction circuit, more important effects were produced.

The charge cannot be derived from an alteration in the volume of the vessel, due to the electric pressure, as it continues for some time after the discharge. A much slighter expansion is observed if the apparatus is filled with water (the rise being 0.35—0.20 with water, as against 10.8—9.3 with petroleum), so that it cannot be due to the decomposition of the fluid.

If the inner test-tube was coated with tinfoil on both sides, and if the inner as well as the outer coating was connected with the poles of the inductorium by means of an insulated wire passing through a cork, the petroleum rose in the same manner between the glasses.

A copper cylinder, 4 centimeters high, 3.3 thick, and open at both sides, was set in a glass, and there was placed within a second copper cylinder 4 centimeters in height, 1.6 centimeters wide, closed below and tapering upwards to a neck like that of a bottle. on the latter there was placed a capillary tube, running horizontally, and dipping with its end into a glass of benzol. This glass was filled with pure benzol and plunged into a vessel set in sawdust. On connecting both metal cylinders with the induction apparatus the air in the inner cylinder was always expanded. On filling the glass with water or air nothing occurred. Similar results were obtained with a Bunsen voltameter made out of a test tube (and having platinum electrodes of 40 square centimeters in size, and placed at a distance of 5.5 millimeters from each other) on alternately electrifying the electrodes and placing a capillary tube upon the orifice.

A current passing through the liquid between the cylinders of the apparatus described above could not be demonstrated by means of a sensitive galvanometer.

In two apparatus like that first described, but with white metal plates of different size (in the proportion of 1.2) the expansion was larger in the larger apparatus, whilst when it depended on a conduction of the current it would be smaller according to Joule's law. The heating of dielectric bodies of alternating dielectric polarization is thus beyond doubt.

ON THE USE OF THE ELECTROMETER IN MEASURING THE RESISTANCE OF LIQUIDS ACCORDING TO MANCE'S AND WHEATSTONE'S METHODS, AND ON THE RESISTANCE OF CERTAIN ALCOHOLIC SOLUTIONS OF POTASSA.—By G. Guglielmo.—The author finds that in the determination of resistances, Wheatstone's method has a great advantage over that of Mance, and he uses an electrometer in the bridge. The current of the circuit is only closed momentarily, and at the same time the electrometer is separated from the bridge by means of a suitable key. Thus the interval of time between the close of the circuit and the separation of the electrometer is vanishingly small, and the polarization is without essential influence upon the electrometer, as was proved by experiments with a decomposition apparatus consisting of platinized platinum plates, 15 centimeters square.

The conductive force, K_t, of solutions of potassa in alcohol at the temperature t, is thus found for different numbers, N_{18}, of molecules. The author gives his results in a table.

For determining the electromotive force of the polarization Guglielmo introduces into one branch, C D, of the Wheatstone combination, A B C D A, the battery and the polarising apparatus, makes the branches, A B=B C=r, connects D with the earth, B with the electrometer, and makes the resistance of the branches A D=C D. Then the potential difference read off on the electrometer is $\Delta = \frac{1}{2}(E-e)$, where E represents the electromotive force of the circuit and e that of the polarization. If E is known e may be calculated. If the conduction to the earth is introduced not at D, but at a point, D_i, between the circuit and the polarizing apparatus, and if the resistances are again made A B=B C and A D_I =D_1 C, the potential difference in the electrometer is $\Delta_I = \frac{1}{2}(E+e)$, so that both E and e may be deduced from Δ and Δ^i.

If *e.g.*, a large positive electrode of zinc and a zinc wire enclosed in a glass tube up to its end (which is 4.5 millimeters long and 3.3 in thickness) the electromotive power of the polarization of the zinc wire by hydrogen=0.45 D.

A non-conductor of electricity has yet to be found, for all substances hitherto discovered are conductors of the force under certain known conditions; but those which offer a great resistance to it serve the purpose of non-conductors in practice, although they may be all classed as good or bad conductors. The best conductor known at present is silver; the worst conductor is solid paraffine.

New Electric Terms.

In following the development of electric engineering, all the world is learning new teems and new language. Words which three years ago either did not exist or were understood only by men of science, are to-day in the common language of engineers and their workmen—to-morrow will be used by the general public. "Electromotive force" and "current," "volts" and "ampères," are becoming terms as well known as "pressure of water" or "cubic feet of gas," and it is necessary that this should be so, as the time is fast approaching when the public will find their quarterly bills for the supply of electricity made out in "volts" and "ampères," and will have a right to sue their local electric company if their daily supply of "current" is insufficient or as given at a wrong "electromotive force."—*London Times.*

The following is the number of Edison plants now in operation in the various countries of Europe: France, 32 installations. 2,680 lamps; Italy, 11 installations, 5,777 lamps; Germany, 28 installations, 3,667 lamps; Holland, 4 installations, 1,648 lamps; Austria, 7 installations, 1,724 lamps; Russia, 14 installations, 2,772 lamps; Belgium, 12 installations, 1,268 lamps.

In the first district of New York City the company is now lighting 310 buildings wired for about 6,225 lamps. The only obstacle ever encountered, namely, the purely mechanical one of the regulation of the engines, it is announced, has now been entirely overcome; the engines are running smoothly, the light is steady, and the customers express satisfaction.

In Illinois, the Sperry Electric Light, Motor & Car Brake Company, of Chicago, has been incorporated. capital stock, $1,000,000; incorporators, Elmer A. Sperry, Edward B. Palmer and Loren Greene.

Edison Light Fixtures.—Bergmann's Factory Enlarged.

The large factory originally occupied by the United States Electric Lighting Company for the manufacture of Maxim lamps and dynamos, has been purchased from them by Messrs. Bergmann & Co., for a factory for manufacturing house fixtures and appliances for the Edison light. About 300 men are at present employed. They are all engaged exclusively in manufacturing those details pertaining to the Edison light system which are outside of the dynamo, the lamp and the street conductors, namely, such articles as electroliers, brackets, meters, junction boxes, galvanometers, various kinds of testing apparatus, and a variety of other special Edison devices. Messrs. Bergmann & Co. originally arranged to manufacture these articles only for the United States, but from the fact of their being the first in the field, and owing to the rapid spread of the Edison system all over the world, they are now shipping goods to all parts of Europe. They have recently imported from England, and now carry in stock, many unique and costly designs of electroliers and brackets. These are similar to those shown at the Crystal Palace exhibition in connection with the Edison exhibit, by the London makers, Messrs. Verity & Co., of Covent Garden.

The building purchased by Bergmann & Co., from the United States Electric Lighting Company, having proved inadequate to the rapid growth of their business, they have recently erected and put into operation a new brick building, 25x100 feet, contiguous to their factory, to be occupied as a brass-foundry annex to their main establishment. By means of this factory they are enabled not only to obtain their castings with promptness, but also to secure a better and more suitable article for the requirements of the business.

In their show rooms they are gradually accumulating, in addition to their standard goods, a great variety of fixtures of rare and rich designs. The electric circuits in the building are so arranged that sample fixtures can be illuminated instantly, so as to show the effect produced when lighted. Messrs. Bergmann & Co. will soon issue a new edition of their catalogue, which will contain cuts, with prices of all the latest designs and apparatus now manufactured by them, including some of these imported designs.

Getting it Down Fine on Burglars.

It is getting so that even burglars are seriously interfered with in the practice of their professions. A recent invention is connected with a safe, and is so arranged that when the burglar touches the safe an electric light is thrown upon the face of the burglar, and a prepared plate inside the safe door transfers the man's picture, so he can be identified. If this thing keeps on, a poor burglar will have to send an agent to burgle for him, or he will get into trouble. The life of a burglar is becoming full of terror.

REVIEW

OF THE

legraph and Telephone,

(AN ELECTRICAL JOURNAL)

UBLISHED SEMI-MONTHLY AT 23 PARK ROW.

P. O. BOX, 6629.

WORTHINGTON, - - Editor and Proprietor.

SUBSCRIPTION.

ited States and Canada, $2 00 per annum, in nce.

eat Britain and other foreign countries, $2.50 = = 13 francs, in advance. Postage free.

ADVERTISING.

ansient rate, 35c. per line each insertion.
Business specials," 50c. a line.

EDITORIAL ANNOUNCEMENT.

e invite correspondence from Electricians, Inventors he Telegraph and Telephone fraternity on matters ining to electrical and scientific subjects, and all facts ecial interest in connection therewith.

ose desiring to recommend their goods can do so to extent in our advertising columns, but we will not sh for pay anything of that nature in our reading ns.

bscribers can at any time have the mailing address eir paper changed by sending both old and new ess. Wm. Dawson & Sons, 121 Cannon Street, on, England, are our accredited representatives reat Britain.

e Editor does not hold himself responsible for opin- expressed by his correspondents.

notice is taken of anonymous communications.

DEALERS SUPPLIED WITH THIS PAPER BY

merican News Company, New York.
merican News Company, Denver, Col.
merican News Company, Kansas City, Mo.
merican News Company, St. Paul, Minn.
ew York News Company, New York.
ew England News Company, Boston, Mass.
entral News Company, Philadelphia, Pa.
Vestern News Company, Chicago, Ill.
t. Louis News Co., St. Louis, Mo.
incinnati News Company, Cincinnati, Ohio.
ittsburgh News Co., Pittsburgh, Pa.
altimore News Company, Baltimore, Md.
an Francisco News Co., San Francisco, Cal.
ontreal News Company, Montreal, Canada-
oronto News Company, Toronto, Ontario, Canada.
Dawson & Sons, London, England.
Duquet, Quebec, Canada.
Kramers & Son, Rotterdam, Holland.
old Mendel, Berlin, Germany.
Osborne, Calcutta, East India.

NEW YORK, FEBRUARY 15, 1883.

CONTENTS.

Electrical Energy.

Some of the phenomena of electricity attracted observation from the earliest period. In 1671 Otto Guericke made an electrical machine with a globe of sulphur to be excited. This was the first form ever made. A sphere of glass was afterwards introduced, then a cylinder of glass, and finally a round glass plate, which was rubbed with dry silk.

In the year 1745 Prof. Muschenbroek, of Leyden, conceived of the idea of collecting and confining the sparks of this electrical machine. He employed a large glass jar nearly full of water, with a long iron rod penetrating through the cork into the water. The object he contemplated was partly accomplished, but the accumulation of electricity was not manifested owing to the want of an outside conducting surface.

Like many discoveries, the perfecting of the Leyden jar was the result of accident; for one of the pupils by the name of Cuneus, in a subsequent experiment, grasped the jar to hold it while disconnecting the rod from the electrical machine; his hand, serving for the outside coating, gave the desired effect, and this student in the new field of science received a stunning shock. Without disclosing his experience, and with a degree of forethought worthy of a better motive, he repeated the experiment upon Prof. Muschenbroek so successfully that he did not recover from the effects for several days.

We may store up electrical energy of very high potential in the Leyden jar and make use of it at intervals instead of taking it continuously from the machine, but the potential of the jar cannot be made to equal that of the charging machine.

It is a fact deserving consideration, that the accumulation of electricity by the Leyden jar increases the quantity effect, and diminishes the intensity of the electricity accumulated.

As the Leyden jar serves to increase the discharge without prolonging its effect it is not usually considered under the head of electrical storage of this age of electricity. It has the property of producing secondary currents in an induction apparatus when discharged through the primary coil. With a strong charge this secondary current may be caused to melt a foot of platinum wire. And alone or in connection with its induced effects will no doubt play an important part in the storage of electrical energy in the future.

In the year 1762, M. Sulzer noticed the electric current which is occasioned by a piece of lead and a piece of silver in contact with each other and with the tongue, and he thought that this effect was due to a solution of the metals. This may be considered the earliest mention of chemical action in the production of electricity, with which we have largely to deal in considering the storage of electrical energy.

This very simple experiment was repeated by the philosophers throughout Europe; was made the subject of lengthy discussions, and long after referred to in defense of the famous "contact force" which Volta and his followers considered to be the urging power of the Voltaic current.

In the year 1790 Paetz and Van Troostnick decomposed water into its constituent gases by passing electric sparks through water from gold electrodes.

In 1791, Galvani discovered that convulsions were produced by estal lishing a communication between the nerves and muscles of a frog's legs, by means of metals; thus laying the foundation from which the Galvanic battery afterwards sprung.

In 1799 Fabroni, disclosed the fact that the phenomena of galvanism originated from the action of chemical affinities.

In the year 1800, Volta, Professor of Natural Philosophy at Parvia, in a letter to the Royal Society, dated March 20th, announced the discovery of the voltaic pile now known as the galvanic battery. The first form of this battery consisted of silver and zinc disks separated by moistened cardboard, the silver zinc, and card board being placed in series and wet with salt water.

The pile devised by Volta owed its origin to the interpretation which this philosopher gave to the remarkable experiment, by Galvani, namely, that a frog's legs undergoes commotion when contact is made between the nerves and muscles by metals.

Volta had previously added to the apparatus of the electrician what is known as an electrophorus, an apparatus exemplifying in a remarkably striking manner the action of induced electricity.

The researches of Lavoisier, La Place, and Fabroni, relative to electrical excitement by evaporation of fluids, by the solution of solids in acids, by every instance of sudden change of state, and of rapid chemical action, had indicated the close connection between electricity and chemical action, which proved of important bearing in the development of Volta's pile.

It may be easily believed that Volta was influenced in his discovery by the study of the electric torpedo, as he called his apparatus an artificial electrical organ (organe electrique artificile).

Although the discoveries of Volta were far surpassing in importance those by Galvani, they were at first considered merely subservient to the purpose of giving greater effect to the experiments of the latter, and because the battery of Volta was chiefly employed to illustrate the discovery of Galvani, it received the name of galvanic battery, and the new branch of science founded upon it is termed galvanism.

[*To be continued.*]

The new trunk line from Paterson to Morristown was completed on the 24th ult. The wire is now being rapidly strung, so that all exchanges in the New Jersey territory and New York City can get Morristown through Paterson by February 1st. Manager Noonan, with a large gang, commenced to penetrate this territory about December 15th. Since that time he has built the Morristown trunk, and is now building a beautiful line to Dover and Stanhope, and establishing an exchange at Dover. This line will eventually be the trunk line from points in Pennsylvania to New York City.

Mr. Noonan keeps a wire strung from Paterson close behind his gang, so that when he is not with them himself he can handle them from Paterson. The telephone now at Denville, N. J., for the use of the construction gang, has been used between there and Brooklyn with splendid results. This instrument was changed to Dover February 1st, a point four miles beyond.

Mr. H. W. Pope has purchased of Messrs. Delano and Haines, and other parties in interest, the controlling interest of the Brooklyn District Telagraph Company.

Mr. Pope considers this company one of the most promising of the many in which he is interested. The company has in operation three district offices in prominent locations, and will open others as circumstances warrant.

Mr. N. W. Lillie, who has been lately connected with the Mutual District Telegraph Company of Boston, and who for several years filled the office of superintendent with the Boston Telephone Dispatch Company, has resigned his position with the former organization, and is now open for an engagement, preferably in the telephonic field. Mr. Lillie is anxious to return to his first love.

A bill to tax telephone companies three per cent. of their annual receipts has been favorably reported in the Indiana Senate.

Mr. Walter P. Phillips, whose system of steno-telegraphy has just been adopted by the Mutual Union Telegraph Company, is rapidly perfecting an automatic system by which, in a test made last Saturday over 500 miles of wire, important results were achieved. Messages were sent through a loop passing through Washington, Pa., and received at the office in Washington, D. C, as clearly and quickly as if sent from the one instrument to the other without the intervening distances. Mr. Phillips aims to avoid the perforation of the slips. He transmits from a matrix prepared upon paper slips by a Morse operator, with an ordinary key. This strip is then run through a clock-work arrangement at any desired rate of speed, the result being taken at any station with the same inking apparatus used in steno-telegraphing. A rate of 200 words per minute was easily attained.

Telephonic Repeaters.

The English electrical papers are publishing accounts of the success of a telephonic repeater invented by Mr. A. R. Bennett.

It consists in introducing between the two lines, which are desired to repeat into one another, induction coils of suitable proportions.

One of the lines is connected with the primary of the coil, and the secondary is placed in the other line circuits.

As a matter of fact, there is very little new in this device. It was certainly used in the autumn of 1879 by Mr. Thomas A. Watson and myself, the object we had in view being the same as that of Mr. Bennett, viz., the communication of the articulating currents inductively from a metallic to an earth circuit, or *vice versa*.

The only reason we did not continue this, and introduce the plan universally, was that we found that on nearly all the lines the increased loudness attained on the direct circuit compensated so nearly the interfering noises that there was no sufficient advantage apparent in the use of the coils to warrant their introduction.

To any thinking electrician who has examined the Blake transmitter, this plan of inductive repetition would be at once suggested, since in every such instrument it is used, the electrical undulations in the primary coil being caused to induce similar currents in the secondary. THOS. D. LOCKWOOD.

A LONG STEEL ROPE.—A rope of refined cast steel has just been sent by the Roeblings from their mills in Trenton to San Francisco. It is 20,440 feet long, its diameter is one inch and a quarter, and it weighed 51,000 pounds. It was put in two box cars, each open at one end, half the rope in one car and half in another, but in a continuous coil. The rope is for use on a street traction railway in San Francisco.

Influence of Electric Light on Health.

The influence of the electric light on health was lately discussed at a meeting of the Hygienic Society of Hamburg, and Dr. Kruss gave his views on the subject at some length. He referred to the influence of the electric light on the human eyesight, and expressed his opinion that it produces no evil effects, the light having a violet tinge under most circumstances. The electric light being free from the disadvantages incidental to the combustion of gas, in the consumption of oxygen and the production of carbonic acid, he considered its development as being a hygienic measure of importance.

The Mutual District Messenger Company of Boston has in operation seven district offices including branches, and its service is increasing rapidly.

The negotiations between the Western Union Telegraph Company and the Mutual Union Company for an amiable arrangement between the two companies have been completed, and resulted in the lease of the Mutual Union property to Western Union. The lease is a perpetual one, and the considerations are the guarantee of the principal and interest of the $5,000,000 bonds of the Mutual Union, and 1½ per cent. yearly upon its $10,000,000 of stock. The Western Union assumes all contracts for service, press and individual, and for leased wires made by the Mutual Union. The fixed yearly charges assumed by the Western Union are as follows: $300,000 interest on the Mutual Union bonds, $150,000 dividends on stock, and $50,000 to meet the requirements of the sinking fund provided for in the bonds—a total of $500,000. The present gross earnings of the Mutual Union lines are officially stated to be at the rate of about $1,600,000 a year, of which at least two-thirds is required for operating expenses, leaving net earnings not much in excess of the requirements of the bonded debt. By a consolidation of offices, reduction of working force, and other economies, it is estimated that the Western Union can operate the property for much less than the present cost. The Western Union will also receive about $100,000 a year of the dividends and interest payments upon stocks and bonds of Mutual Union which it owns.

The lease was ratified by the directors of both companies, and will be ratified by three-fifths of the stockholders of both, as required by law. The Mutual Union will, of course, maintain its formal organization, and one or two of its original directors may in time be elected into the Western Union directory.

The property will be turned over to the Western Union as the details of the lease can be arranged. It consists of about 46,000 miles of wires, and offices between Portland, Me., and Chicago and St. Louis.

As a consequence of the lease, all suits between the two companies will be discontinued.

It is now promised that the Postal Telegraph Company will have its line in operation to Chicago some time in April. President Beard says they are pushing the work vigorously, and that their lines will enter Chicago underground.

The Manhattan District Telegraph Company of New York has in operation four district offices and one thousand boxes—and other offices and districts in course of construction.

The Denver District Telegraph Company, Denver, Col., is opening its second district, and its promotors are confident of 10 per cent. net the first year of its operation.

Hon. Marshall Jewell Dead.

The Hon. Marshall Jewell, President of the National Telephone Association, President of the Connecticut Telephone Company, and Chairman of the Republican National Committee, died at 9.55 on Saturday evening, the 11th inst, of bronchial pneumonia. Mr. Jewell was born in Winchester, N. H., on October 20, 1825. He was the son of Pliny Jewell, a noted leather tanner. Mr. Jewell was bred a tanner, and followed this avocation until he had completely mastered the business. He was in early life interested in the construction of telegraph lines in the Southwestern States. In 1850 he began, in company with his father and brother, the manufacture of leather belting in Hartford, and during the war branched into the making of knapsacks, of which he furnished a great number to the Government. In 1869 he was elected Governor of Connected, and was re-elected in 1871 and 1872. In 1873 he was nominated by President Grant as Minister to Russia, from which position he was recalled in the spring of 1874. Soon after his return to this country he was appointed Postmaster-General by President Grant, which position he subsequently resigned. In 1880 he was chosen Chairman of the Republican National Committee.

He was also special partner in the large dry goods establishment of C. H. Root & Co. of Detroit, where he was also interested in lumber interests. He leaves a widow and two daughters. Mr. Jewell contracted a severe cold while in New York on business connected with the National Republican Committee, which, however, caused no apprehension until within a few days, when symptoms of bronchial pneumonia developed. Dr. Curtis, his physician, expressed a desire for consultation with Dr. Loomis of New York, who arrived here at midnight on Friday. So alarming were the symptoms that the family telegraphed for his daughters, who reside in New York and Detroit, and they arrived on Friday night. Mr. Jewell realized his condition, and retained his faculties to the last. This afternoon Gov. Jewell said to the physician: "Doctor, how long does it take?" The Doctor inquired what he meant. Governor Jewell replied: "How long does it take for a man to die?" "In your condition, Governor, it is a matter of only a few hours." Governor Jewell then said, "All right, Doctor," and settled back quietly upon his pillow.

A petition for a general telephone law, signed by citizens of North Adams, Mass., is before the Massachusetts Legislature. It begins as follows:

"The undersigned persons, firms, and corporations, who desire the telephone business to be so regulated as to render the public uniform service at uniform rates and equitable charges, respectfully petition your honorable body to pass a general telephone act, which shall enable every person, firm, or corporation to secure the use of a telephone at uniform rates to all persons, firms, or corporations similarly circumstanced, and to prevent the telephone company or exchanges asking or obliging the public or their subscribers to sign or to agree to any arbitrary or discriminating rules and regulations limiting the use of the telephone, so far as persons, firms, or corporations or the subject matter of their messages are concerned; and to enable the public to use all telephone exchanges now or hereafter to be established, and to enable the public through the exchanges or any subscriber through his telephone to communicate by telephone without restraint or discrimination as to persons, firms, or corporations or the subject matter of their messages."

The lease of the Mutual Union Telegraph Company's property to the Western Union Telegraph Company was formally assented to to-day by seven-eighths of the stockholders of the former company and over three-fifths of the stockholders of the latter company. Many rumors were current in the street that injunctions had been or would be applied for to restrain the carrying out of the lease. Up to a late hour this afternoon the executive officers of both companies said that no injunction papers had been served upon them. Mr. W. S. Williams the principal individual litigant against the Western Union, was generally spoken of as likely to take measures to prevent the execution of the lease. He said that, as far as he knew, no legal action adverse to the lease had been begun, but he considered it probable that objections to it would be raised. The lease is to become operative on Feb 15. The guarantee of the Mutual Union bonds is assured not only by contract, but the Western Union Company will stamp its guarantee of the principal and interest upon each bond upon presentation. The dividends on Mutual

Union stock are to be paid in the aggregate to that company for two years, that is, until February, 1885, and after that date they will be paid directly to the stockholders by the Western Union Company.

All the Telegraph Companies Come Down.

The Western Union and the Mutual Union Telegraph Companies have reduced their rates for business between this city and Washington and intermediate points to the rates of the Baltimore and Ohio, and the Bankers' and Merchants' Telegraph Companies, namely, fifteen cents for a standard message of ten words, and one cent for each additional word.

Married.

On the 17th ult., Mr. Clark B. Hotchkiss, the popular General Agent so well known, in telegraph and telephone circles, was married to Miss Margaret M. Porter, of Orange, N. J., the ceremony, which was a very brilliant affair, took place at the Central Presbyterian Church, at that place, and was followed by an elegant reception at the residence of the bride's uncle, Mr. James K. Morgan. The presents were many and costly. After a very enjoyable supper and dancing, the happy party left for Philadelphia, Baltimore, Washington, Richmond and the Southern cities, for a three weeks' trip.

Splendid Progress of the Long Island Telephone Business.

"The telephone business on Long Island may fairly be said to have commenced when L. B. Harris, general agent of this company, took charge in October, 1881, with 108 subscribers to start; by push and energy he had in July, 1882, increased the list to 801.

Since then we have remodeled the principal office, rebuilt many pole lines, and now have in Brooklyn alone 1300 subscribers, with applications coming in almost as fast as we can find room for wires.

The pole lines of Brooklyn are among the finest and largest in the country.

Outside of Kings County we have just opened Flushing office, with 50 subscribers, and will immediately open in Long Island City, College Point and Whitestone, and Jamaica.

During the coming season lines will be run to all the principal towns on the Island, and exchanges operated in many places.

At Coney Island during the season we shall have pay stations at the principal hotels.

There is not to be found probably in the whole telephone field a more striking example of what energy and skillful management can accomplish than is exhibited in the foregoing brief statement of the enormous strides made in the Brooklyn District and vicinity, when no progress had been made at all, until Mr. Harris entered that field, and more recently was succeeded by that most efficient and able of General Superintendents, Mr Sargent. We shall note from time to time, the advance of the telephone interests in this district of which so little has been known hitherto.

Telephonic Receivers.

Professor Silvanus P. Thompson has lately devised a new form of telephonic receiver of the type originally invented by Phillip Reis. In the Reis instrument the telephonic currents are received in a coil of wire surrounding a needle or rod of iron, or steel mounted upon a suitable sounding box of wood. The variations of the strength of the current produce variations in the degree of magnetization of the needle, which, in consequence of the molecular changes thus set up, emits sounds. The final result of such molecular changes is, in general, to produce either an expansion or a contraction of the needle If it be iron, steel or cobalt, an increase of magnetization will cause it to expand in the direction of its magnetization, while if it be nickel the contrary will take place. In the well-known needle instrument of Reis, the sounds emitted are not loud, partly because the mass of magnetic metal is too great to permit the required changes in its degree of magnetization to be rapidly effected, and partly because the acoustic arrangement of the parts is defective and inconvenient. Professor Thompson's improved instruments are based upon the same principle of utilizing the expansion and contraction arising from the molecular changes set up by the varying degree of magnetization due to the telephonic currents, and the improvements relate to various methods of obviating or avoiding the defects of the Reis instrument, whilst preserving and developing its fundamental principle.

The Telephone Case in London.

The appeal of the defendants in the case of the United Telephone Company *vs.* Harrison, Cox-Walker and Company, came on for hearing on the 31st ult. in the Court of Appeal, before the Master of the Rolls and Lords Justices Lindley and Bowen. We understand that the appeal of the plaintiffs in regard to that portion of Mr. Justice Fry's judgment which pronounced the Edison patent invalid, has been abandoned; the United Telephone Company having preferred to amend the specification by disclaimer, and thus render the patent for the future valid. A novel point has been raised on the appeal which was not fully taken in the court below, viz., that in Bell's receiver, as illustrated in his specification, the attachment of the steel diaphragm or tympan to the rest of the instrument is of such a character as to permit "reed" vibrations The defendants' contention on this point seems to be not that the nature of the sound vibrations of the armature either in this instrument or in the Reis anticipation, is of a reed character, but that the sound vibrations are of a "tympanic" or molecular character, independently of any special mode of attachment. Possibly this contention as to the meaning of Fig. 19 of Bell's specification, may postpone for some time longer the decision of this appeal, as the Lords Justices have intimated that they may require to send back the case for evidence to be given by experts as to the true intent of this illustration. The appeal stands adjourned to Friday the 9th inst., when the defendants' arguments will be continued.

The Lowell Telephone Interest.

The following statement of the condition of telephone companies, largely owned at Lowell, upon the 9th day of January, 1883, and showing the gross revenues and expenditures for the three months ending December 30, 1882, have been subscribed and sworn to:

THE NATIONAL BELL TELEPHONE COMPANY, OF THE STATE OF MAINE.

Assets.

Construction	$504,529.20
Expense	20,117.66
Due from divisions	23,121.15
Cash	124,442.64
	$672,210,65

Liabilities.

Capital stock	$500,000,00
Surplus	36,045,00
Profit and loss	1,200,16
Gross revenue	38,444,46
Bills payable	96,521,03
	$672,210,65

BOSTON & NORTHERN TELEPHONE COMPANY.

Assets.

Construction	$784,611.00
Expense	17,782.58
Due from divisions	14,073.59
Treasury stock	25,000.00
	$841,467.17

Liabilities.

Capital stock	$700,000.00
Profit and loss	14,712.06
Gross revenue	32,483.89
Bills payable	94,271 22
	$841,467,17

THE BAY STATE TELEPHONE COMPANY.

Assets.

Construction	$795,795.57
Due from division	11,919.82
Expense	17,018.37
Cash on hand	8,681.06
	$833,414,92

Liabilities.

Capital stock	$800,000.00
Gross revenue	33,414.92
	$833,414.92

THE SUBURBAN TELEPHONE COMPANY.

Assets.

Construction	$310,103.58
Due from divisions	7,358.30
Bills receivable	75,000.00
Expense	8,015.39
	$400,477.27

Liabilities.

Capital stock	$350,000.00
Gross revenue	19,047.10
Bills payable	31,430.17
	$400,477.27

UNION TELEGRAPH & TELEPHONE COMPANY.

Assets.

Construction	$104,535.36
Due from divisions	2,554.77
Expense	1,437.05
	$108,527.18

Liabilities.

Capital stock	$100,000.00
Gross revenue	4,827.04
Bills payable	3,700.14
	$108,527.18

THE AMERICAN BELL TELEPHONE COMPANY.—The Committee on Mercantile Affairs of the city of Boston gave a hearing, on Feb. 1, at the State House, on the petition of the American Bell Telephone Company, for the repeal of that portion of its charter which prohibits it from owning more than thirty per cent. of the capital stock of any other corporation doing a cognate business, or licensed by it to do telephone business. Gen. P. A. Collins and Mr. E. P. Brown represented the company, no one appearing to oppose the granting of what was asked for by it.

PURCHASE BY THE AMERICAN BELL COMPANY.—Negotiations were completed in Boston, on the 1st inst., for the sale of a majority of the stock of the Central District Printing Telegraph & Telephone Company, of Boston, to the American Bell Telephone Company, of Boston. The Pittsburgh Company had bought an immense district covering Western Pennsylvania, Eastern Ohio and part of West Virginia. The capital stock of the company was $500,000, of which $342,000 was held by a syndicate, $145,000 by the Western Union Telegraph Company and the local exchanges. The Pittsburghers who were in the deal claim to have made $650,000 by the transaction.

The Williams Telephone Switchboard.

In the month of May, 1877, an order was given by Mr. E. T. Holmes of Boston, who at that time was and still is, engaged in conducting an extensive system of burglar alarms, to Mr. Chas. Williams, Jr., of 109 Court street, Boston, for the manufacture of a small switchboard, which was to be used for the temporary union for purposes of oral communication between any two lines of a number of burglar alarm lines, which were experimentally fitted with telephones, in order that the exchange system now so well known might be given a fair trial. This was the first switchboard ever made for telephonic purposes, and consisted simply of a few plates of brass perforated for the reception of plugs, and fitted with binding screws for the reception of the necessary wires.

It may still be seen by any one, since it is fixed up over the door of Mr. Holmes' office, where it is kept as a curiosity.

The line was led to a brass plate and from thence by a plug and flexible conductor to the galvanometer and alarm bell. If one firm wanted another, the burglar alarm instrument was caused to operate, and the attendant would then withdraw the galvanometer plug and substitute another plug, which by a second flexible cord connected with a telephone whose other terminal was attached to a ground wire. If two lines were to be connected together for conversation, another telephone having a cord and plug fastened to each binding screw, was looped between the brass plates of each line, thus at once forming the link between the two and the supervising medium.

To attract the attention of either party and notify them of a desired communication, the galvanometer plug would be withdrawn as before, and a plug connected by suitable wires with a press button and battery was connected instead, and the signal given by pressing the button a required number of times.

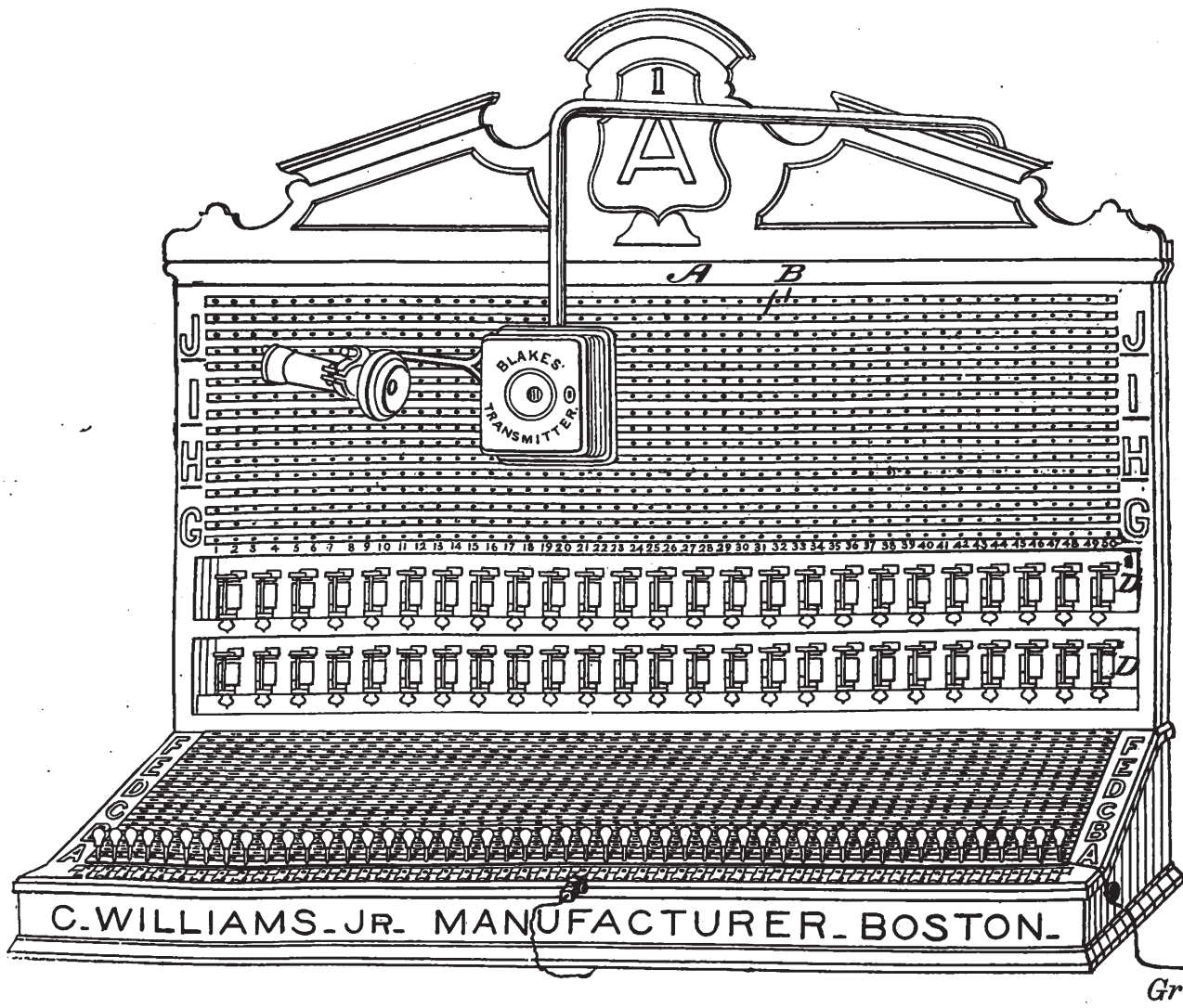
Thus we see that all the essential elements of a telephone switch were in this board, although in a crude and immature form.

We have referred to this switchboard and been thus careful in particularizing it, that we may the more graphically show the enormous progress which has, in the few years which have elapsed since the inception of the telephone exchange, been made in this class of electrical appliances.

To do this, it is but fair that we contrast the later product of the same factory with its progenitor, which we have described.

For excellence of construction, for solidity, for handsome appearance, and for convenience of operation, the present Williams board has no superior; while its simplicity in electrical arrangements is unparalleled. For these reasons it stands foremost among switchboards for telephone central offices where there are not more than 300 incoming lines. In offices where the number of lines exceeds that amount it becomes, in a great measure, more a question of system, arrangement, and method of operation, than of the switchboard to be used.

In the engraving, which shows a perspective view of the board, the general appearance is clearly shown. Externally, as already indicated, it is a model of tastefulness. The woodwork, generally speaking, is of black walnut, although, of course, it can be readily made of any desired wood. The general form of the board resembles a desk with a rather high upright part, and the top or cornice is arranged to present an ornamental appearance.



Stretching across the upper part of the desk, so to speak, are a number of connection bars, which are of brass, and which are sometimes left in the brassy state, sometimes, but rarely, painted of different colors, like the coat of the Hebrew patriarch, and sometimes nickel-plated. More generally a part of them are nickeled and the other part left brassy.

On the inclined part of the desk below are fastened a second series of strips, which also extend from end to end of the board. Between the metal connection bars or strips on the vertical part of the switch and those on the slope are placed two wooden shelves, which fill in the lower part of the upright back, and upon these are placed the annunciators, of which any number can of course be used, depending upon the size of the switchboard. The drawing shows a fifty-line switch; there are therefore fifty annunciators.

On the extreme front bar of the lower series of connection bars a row of ebonite handled brass plugs are seen, and immediately in front of these are a row of brass spring jacks, one for each line.

A Blake transmitter and a hand telephone are suitably fastened to an adjustable arm, which swings over in front of the board, being pivoted at the rear.

The letter A at the top of the board designates the wooden baseboard, and B denotes the connection bars. The letters D at the right hand side indicate the annunciators, and the large Roman capitals which appear at both sides are actually painted on the board, and serve to distinguish the different groups of connection bars.

The letter A, of somewhat gigantic dimensions, which appears in the center of the cornice, modestly endeavoring to hide its head behind the transmitter arm, and accompanied by a satellite in the form of a figure 1, is not, as might be supposed, indicative of

the superlative excellence of the entire apparatus, although it may justly be rated as A1, but is merely a letter and number, whereby, if used in a grouping system, it may be readily designated.

We have now fully described the switchboard as it appears to the eye of the ordinary observer.

To the operator, inspector, or manager, however, such a description conveys no information. It is necessary, then, that we should be equally specific with reference to the electrical features of the board.

We shall, therefore, first attempt to trace the course of a line circuit through the board from line to ground.

The incoming line strikes first a screw post at the rear and passes at once to the upper part of the spring jack; thence, of course, to the lower part, technically called the shoe, of the same jack, and to the leading-in wire of the annunciator coil. Here it bifurcates, one branch passing through the coil and below the lower set of connection bars, crossing them transversely, terminating by means of the plug, which is inserted in the lowest connection bar at the ground plate.

This lowest bar is connected directly with a ground wire.

The other branch passes upward, crossing all the upper connection bars, and ending at the top, as a normally open branch or spur from the main line.

The method in which the line circuit passes through the board is worthy of special consideration.

It passes successively through a series of springs, which are screwed to the back of the board in such a manner that their free ends press against one another until forced apart by the insertion of a plug between the free ends of any pair. It is quite clear that such a connection could by no means be relied upon to maintain perfect continuity; for every telephone man knows, or ought to know, that every point of a contact in a line circuit is a source of trouble. To prevent any annoyance from this cause, a piece of copper tape runs continuously through both upper and lower branches, and is soldered to both springs of every pair, so that no imperfection can at these points develop.

When it is desirable in the course of business to connect two lines together, with as little resistance in the circuit as possible, the connection can be made on the upper series, thus cutting the annunciator out of circuit.

When a call comes in, and the annunciator falls, a double wedge plug is inserted into the line circuit by means of the spring jack. This introduces the transmitter and telephone, whose wires are connected by cords to the double wedge, and the call is received.

A third wire also passes through the double wedge cord, and ends in a stud on the handle of the wedge.

The upper plate of the wedge is made like a spring key, and may be pressed away from its telephonic connection and down on to the stud.

To the outer end of the stud connecting, wire the wire leading from the generator or battery is attached; and to signal over any line it is only necessary to insert the wedge into the proper jack, and press the spring plate thereof against the generator; this sends the calling current over the line.

This combination of calling key and telephone wedge is the invention of Mr. H. W. Leland, of South Framingham, and has proved a most useful adjunct to the telephone switching system.

To connect any two lines together, and include the annunciator to ring off with, the plugs of the two lines to be connected are to be withdrawn from the lowest cross bar, and inserted in the corresponding holes of anyone of the cross bars of the lower section; when thus inserted, they press the springs apart and thus form the connection.

If, on the contrary, the annunciator is not to be included in the combined circuit of the two lines, the connection must be made on the upper series; this series is often used for connections with extra territorial lines.

To listen or supervise conversation, the wedge is inserted in the spring jack, just as in receiving calls. The ordinary resistance of the annunciator helices is from 75 to 80 ohms.

All contacts are made by rubbing two surfaces together.

All soldering is done with rosin, no acid of any kind being used.

The plug employed is a little over two inches long.

A night alarm is attached to all switches, unless otherwise ordered, and consists in a local circuit fitted with a normally open spring circuit closer at each annunciator, adapted to be closed by the fall of the drop.

This, of course, requires a local battery and bell, which are not included in the outfit of the switch.

The entire apparatus is the result of the united experience and ingenuity of Mr. Williams, Mr. T. W. Lane, Superintendent of the factory, and Mr. Frank W. Harrington, who has, for many years, been in charge of the principal department of Mr. Williams' manufacturing establishment, and who made the first telephone switch and apparatus ever used, which we described at the beginning of this article.

P. C. at the Telephone.

The police booth at Franklin avenue and Fulton street, Brooklyn, was entered by Police Superintendent Patrick Campbell on Saturday evening for the first time, just after a policeman had signalled Police Headquarters in passing. The Superintendent pulled the hook which sends the signal, and put the telephone to his ear. The operator at Police Headquarters, who had just noted the visit of the patrolman, went to the telephone and said, "Well, what is it?"

Superintendent—Who's there?

Operator—None of your business. What is your name?

Superintendent—Who is that?

Operator—Go ahead; give me your name.

Superintendent—I am P. C. (The initials usually given by him to telegraphic messages.)

Operator—None of that now. Spell out your name.

Superintendent—My name is Patrick Campbell. I will come down and find out yours.

The number of calls received at the central station of the telephone company of this city, on the 21st ult., was 2,953, or an average of about 9½ calls to each subscriber.—*Rio Janeiro News.*

The latest bulletin from the census bureau gives statistics of manufactures, showing the capital involved, number of operatives, amount of wages paid, etc., for all the establishments of manufacturing industry in the country, gas excepted. There were in 1880, in the United States, 253,852 manufactories, with an aggregate capital of $2,790,272,606, and employing 2,025,385 men, 531,639 women and 181,921 youths and children. The total amount paid in wages during the year was $947,953,795; the value of the materials used was $3,396,823,549, and the total value of the products was $5,369,579,191. New York, Pennsylvania, Massachusetts and Illinois, in the order named, stand at the head of the list.

A few years ago a wide field was open for young men in telegraph offices throughout the country. Now young women take their places as operators to a great extent, and the young men have to seek other avenues of employment. Mining and electrical engineering present a wide scope for capable young men, and there would seem to be a growing demand for skilled talent in either department.

The following figures are given showing the number of through and way passengers carried by the New York Central Road since 1870:

	Through pass.	Way pass.
1870	112,720	6,932,226
1871	102,814	6,751,420
1872	104,223	7,034,556
1873	121,687	7,509,054
1874	99,657	9,778,695
1875	105,190	9,317,439
1876	132,647	9,148,843
1877	103,048	8,816,399
1878	94,211	8,833,354
1879	94,912	8,035,631
1880	116,306	8,153,551
1881	154,561	8,734,688
1882	207,496	10,101,483

We find among the many applications of electricity in connection with machinery Tates Patent Electric Valve-closing Apparatus, which we think is very useful and practical. We reproduce comments on some of our London exchanges where it has been in use for some time past Mr. L. Hernsheim, 20 Nassau street, is the agent for its sale here.

City Press, Oct. 14, 1882, LONDON.—"The invention is of universal interest, as it enables any person in an emergency to stop engines to which it is applied, on land or sea, and thus to prevent accidents to life and property."

Engineering, Oct. 7, 1872, LONDON.—"This ingenious apparatus by which a steam engine of any kind may be quickly stopped from any distance, by means of an electric attachment, is the invention of Mr. Tate, and is to be seen at the offices of Messrs Duncan Bros., Engineers, 32 Queen Victoria street, E. C. The apparatus can be readily applied to marine engines, locomotives, factory engines, and indeed almost any steam engine. In large mills where the machinery may break down, or some accident happen to life and limb, it is of great importance to stop the machinery at once. In some large works, such as the Jute mills of Messrs Cox Brothers, at Dundee, watchmen are in attendance at every engine to stop it on the alarm being given; but with the electric circuit this expenditure of labor would not be necessary, as one watchman could control several engines, and, moreover, the engines could be stopped by the foreman in the works at the scene of the accident or breakage. This is effected by providing press buttons on the walls within the works, and properly protecting them from wontonness by a glass shield, which would require to be broken before the press button could be got at."

Courting by Telegraph.

The most bashful young man in Pennsylvania lives in Reading. He had courted a young woman in a mild sort of way for a long time, but never had been able to make known his intentions in an intelligible manner. During his leisure hours he taught the young woman telegraphy, and last week gained her consent to stretch a telegraph wire between her home and his boarding house. The first message that came to the young woman was a proposal of marriage. Although the answer was all that any reasonable person could expect, yet the young man was so diffident that he did not venture near the house for four days. Electric communication finally became too slow, however, and the young man went to the house in person. The wire and telegraph instrument are now for sale. If real genius is to be rewarded, this young man ought to be happy.

NEW PATENTS—ELECTRICAL—1883.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JANUARY 2D, 1883.

WEEK ENDING JANUARY 2, 1883.

270,017 Dynamo-electric machine, Alexandre Chertemps and L. Danden, Paris, France.
269,838-9 Electric arc lamp, Charles A. Hussey, New York, N. Y.
269,862 Electric burglar alarm, Charles T. Jackson, New York, N. Y.
269,937 Electric lamp, Charles A. Hussey, New York, N.Y.
170,187 Electric mallet, Joseph R. Finney, Pittsburgh, Pa.
269,888 Electric motor, William L. Silvey, Castleton, Ind.
270,058 Electric synchronizing apparatus for time-pieces, James Hamblet, Brooklyn, N. Y.
269,960 Electric thermostat, Thomas Reeve, Brooklyn, N.Y
269,879 Electric telephone, Henry B. Porter, Chicago, Ill.
270,186 Electric vehicle, Joseph R. Finney, Pittsburgh, Pa.
269,868 Electric wire cable, James MacIntosh, Philadelphia, Pa.
269,933 Insulator for the suspension of electrical wire conductors, Paget Higgs and W. Courtenay, New York, N. Y.
269,824 Telephone transmitter and receiver, James H. Rogers, Washington, D. C.
270,186 Telephonic transmitter, George E. Shaw, Chicago, Ill.
270,125 Watchman's electric time detector, James E. Richards, Cedar Keys, Fla.

WEEK ENDING JANUARY, 9, 1883.

270,518 Apparatus for cooling the armatures of dynamo-electric machines, Peter N. Vander Weyde, New York, N. Y.
270,209 Automatic electric railway, Edward N. Dickerson, Jr., and Charles G. Curtis, New York.
270,478 Coupling for wires and electric conductors, Henry F. Pumphrey, Fairfield, Iowa.
270,352 Device for controlling electrical currents, Charles J. Van Depoele, Chicago, Ill.
270,230 Dynamo-electric machine, Joseph Lewis, Chicago, Ill.
270,325 Dynamo-electric machine, James McTighe and Thomas J. McTighe, Pittsburgh, Pa.
278,248 Electrical car brake, Albert S. Parsons, Huntington W. Va.
270,533 Electrical control for pendulum clocks, Robert W. Wilson, New Haven, Conn.
270,361 Electric arc lamp, Percy Ruskin Allen, Victoria Works, County of Surrey, England.
270,449 Electric arc lamp, Samuel Martin and James F. Richards, Pittsburgh, Pa.
270,488 Electric cable, William W. Jacques, Boston, Mass.
270,491 Electric light, Henry A. Seymour, Washington, D.C.
270,457 Magneto-electric machine, Adam Millar, Glasgow, Scotland.
270,551 Portable Voltaic battery, James Makenzie, County of Middlesex, England
270,305 Railroad signal, Joshua Gray, Medford, Mass.
270,500 Telephonic circuit, J. Milton Stearns, Jr, Brooklyn, N. Y.
570,556 Telephone exchange system, Charles A. Randall, New York, N. Y.
270,326 Telephone switch, Thomas J. McTighe, Pittsburgh, Pa.
270,522 Telephone switch, Thomas A. Watson, Everett, Mass.

WEEK ENDING JAN. 16, 1883.

270,781 Armature for dynamo-electric machines, Warren P. Freeman, New York.
270,777 Armature for dynamo-electric machines or electric motors, Walter K. Freeman, Brooklyn, N. Y.
270,779-80 Dynamo-electric machines, Warren P. Freeman, New York.
270,639 Electric alarm clock, Joseph I. Conklin, Jr., New York.
270,676 Electric arc lamp, Charles A. Hussey, New York.
270,725 Electric arc lamp, George W. Beardslee, Brooklyn, N. Y.
270,867 Electric circuit for railway signaling, George Westinghouse, Pittsburgh, Pa.
270,806 Electric lamp, Wm. F Jobbins, East Orange, N. J.
270,702 Galvanic battery, Gregoire Scrivanow, Paris, France.
270,848 Mechanical speaking telegraph, Abner M. Rosebrugh, Toronto, Ont.
270,774 Perforator for automatic telegraphs, F. M. Foote, Brooklyn, N. Y.
270,778 Secondary electric battery, Walter K. Freeman, Brooklyn, N. Y.
270,735 System of electric lighting for railway trains, Chas. E. Buell, New Haven, Conn.
270,734 System of electric storage and supply, Chas. E. Buell, New Haven, Conn.
270,674 Telegraphic apparatus, William L. Hunt, Port Hope, Ont.
270,652 Telegraph key, William D. Farren, Boise City, Idaho.
270,767 Telegraph key, Edgar A. Edwards, Cincinnati, O.
270,775 Telegraphy, T. M. Foote, Brooklyn, N. Y.
270,752 Telephone transmitter, Witsius A. Crawford, San Antonio, Texas.

WEEK ENDING JAN. 23, 1883.

270,945 Armature for magneto-electric machines; Ezra T. Gilliland, Indianapolis, Ind.
271,140 Combined electric light and gas burner; Wm. A. Shaw, Brooklyn, N. Y.
270,954 Electric arc lamp; Christopher P. Jurgensen, Copenhagen, Denmark.
271,178 Elect ic arc lamp; Edward Weston, Newark, N.J.
270,884 Electric battery fluid; Emile Berliner, Boston, Mass.

Business Notices.

paper will be devoted to the sole purpose of
you conversant and thoroughly posted on all
f an electrical nature, which may be brought
n time to time, in this country and Europe.

e Works of the JNO. A. ROEBLING'S SONS CO., at Trenton, N. J., have facilities for producing large lities of Telegraph Wire on short notice. The Belgian system of rolling long lengths of wire rods, mproved methods of galvanizing, were first introduced in the United States at these works. It insures roduction of wire with few joints, and with a thick coating of zinc.

REVIEW OF THE

TELEGRAPH AND TELEPHONE

A JOURNAL OF ELECTRICAL, SCIENTIFIC AND MECHANICAL NEWS.

Vol. 2, No. 2. NEW YORK, MARCH 1, 1883. [$2.00 Per A
Single Copies,

Entered at Post Office, New York, as Mail Matter of the Sec

Life's Game.

Life's Evil Genius with the sunless wing
And our white Guardian Angel sit and play
Their silent game of skill from day to day,
Where thoughts are pawns, and deeds are queens and kings.
And every move on that strange chessboard brings
Some change in us—in what we do or say;
Till with our life the winner sweeps away
The last few pawns to which his rival clings.
We seem permitted, ever and anon,
To catch a glimpse of that great fatal game
By which our soul shall be or lost or won.
We watch one move, then turn away in shame;
But though we lack the courage to look on,
The game goes on without us all the same.

A New Secondary Battery.

Some experiments have recently been made with a form of secondary battery invented by Messrs. Liardet and Donnithorne, London, Eng., the main features of which, as stated by the inventors, are the intermixture of porous lead, deposited either by direct action by means of a galvanic current, or by the action of spelter, with oxides and salts of lead such as may be produced from galena or other lead ore, as the acting substance of the plates to accumulate the current. This mixture is placed on very thin plates of pure lead, which serve as conductors, and is kept in position by porous plates. Great stress is laid upon the purity of the lead and lead compounds, as by this means the inventors seek to avoid local action and to increase the intensity and durability of the battery. The experimental set of cells consist of 50 elements, each of which has an area of one-twelfth of a square foot, the weight of the set being 315 lbs. The cells, having been charged with a dynamo, are reported to have given a current of 12 amperes with an electromotive force of 95 volts; or, in other words, two have given a sufficient current for one small arc lamp or 25 incandescent lamps. Upon the occasion of our visit to the laboratory at No. 38 Holborn viaduct, this battery supplied seven Edison incandescent lamps with a current. The inventors claim that they have produced a secondary battery or accumulator of half the weight, half the cost, and nearly twice the power of any other. So far as the laboratory experiments have gone, their results appear to be sufficient to encourage the inventors in proceeding with the work of practical development.

Electric Lighting in Mills.

BY C. J. H. WOODBURY.

Although the cruder forms of electric light were made early in this century, preceding the locomotive, the telegraph and illuminating gas, yet the mechanical refinements devised within a few years have been necessary to master many of the practical and economic difficulties, and render it feasible to bring electric lighting from the laboratory to the commercial world, creating an element in manufacturing affairs.

Although our object is to consider electric lighting solely in regard to its employment for industrial purposes, a better understanding may be reached by examining some of the principles involved in its production.

The accumulation of electricity by means of a dynamo machine is based upon two principles: First, that when a wire is moved across a magnet through the field of force, the power exerted against the attraction of the magnet is converted into electricity. Second, when an electric current is passed through insulated wires coiled around a piece of iron, the iron is magnetized.

In a dynamo machine the magnets are very feebly magnetized; but when the armature is revolved it generates an electric current, which passes through the wires around the magnets, increasing their strength and enabling them to produce a stronger current in the armature, and this in turn adds to the strength of the magnets, the armature and the magnets reacting on each other until the limit of the capacity of the magnets is reached, after several hundred revolutions of the armature. When the motion of the armature is stopped the magnets lose nearly all their magnetism, as soft iron will not retain magnetism like steel.

Permanent steel magnets were originally used for this purpose; but electro magnets are capable of holding twenty times as much magnetism as permanent magnets.

This is the rough outline of dynamo machines. Their construction is not so simple a matter, involving numerous problems upon matters which cannot be considered here.

Electricity for lighting might be furnished by galvanic batteries, but the cost would amount to twenty-five times as much as when generated by a dynamo.

There are two methods of converting electricity into light. The arc light is chiefly due to the glowing of the tips of the carbons caused by the high temperature produced by the current overcoming the r offered by the space between the carbon poles, the energy of the electricity is converted int

The carbons are slowly volatilized and burned. The intensely heated vapor adds t mination, but the combustion of the burnin interferes with the light, as the arc light brilliant when enclosed in a glass receiver a ing the air. The incandescent light is pro the current overcoming the resistance offe filament of carbon and raising it to a ten sufficient to render it luminous.

The immediate destruction of the carbo vented by regulating the quantity of the cu enclosing the carbon in a glass bulb and e the air, so that it cannot burn.

Both the arc and the incandescent light the glowing of intensely heated carbon. I light the incandescence is destructive to the and in the incandescent lamp the object is the carbon as enduring as possible under t tions of brilliancy, which are essential for sa results. The arc lamps are placed at openi conducting wires, and the carbons form a p the circuit. The electricity passes through in order, and the tension is reduced a certai at each lamp.

In the incandescent system the lamps are wires swung down from the main condu that the current is divided, an equal portio through each lamp. The comparison is s made that the main conductors could be re by the sides of a ladder, while the position descent lamps would be in the middle of th of the ladder.

In the arc light, where the carbon is heate struction, the total quantity of light for a penditure of electricity is about nine times in an incandescent light working at a co rate. In an incandescent lamp the question ance of the carbon is the second factor in det the most advisable brilliancy for the light.

According to Howell's experiments on th light, if the electricity supplied to a 16-cand Edison lamp be increased one-fourth, th power is doubled, but the endurance of would be reduced.

The golden mean of the true economy bet pense of renewals of lamps and that of pow reached only by long experience.

I presume that the present intensity of which has been adopted is at about the minim for the present construction of carbons.

The unit of measurement of light is exp candle power, which is the light furnish standard wax candle burning 120 grains The candle power of burning gas is the lig

by an argand burner consuming five cubic feet of gas per hour.

With the incandescent lamp the light is nearly uniform in all directions.

In the arc light the terminals of the carbons are different, the lower carbon consuming to a sharp point, and the upper one is blunt and the end concave. The light emitted from these ends is not alike; the upper carbon having the most heated surface, about nine-tenths of the light is thrown downward below a horizontal plane. The power of arc lights, as generally stated, is that of the strongest rays which are thrown down at an angle of 45 degrees, which is about twice the brilliancy of the average light. Nearly half of the light is held back by the white glass tubes, and the arc lights being further apart an excess of light is necessary to secure sufficient diffusion at extreme points, because the intensity of light diminishes as the square of the distance.

The value of electricity for lighting mills is based upon the character of the illumination desired, each mill being, to some extent, a law unto itself.

One of the first items of consideration is the influence of electric light upon the operative, considered as a machine to be kept in good condition, in order to obtain the best results. As the electric light does not require any air to support combustion, it does not injure the air in a mill.

On the other hand, Dr. William A. Hammond states: "A gas burner consuming four cubic feet per hour produces more carbonic acid gas in a given time than is evolved from the respiration of eight adult human beings."

This is an important matter in night work, when the air becomes so impure that it prevents the operatives from doing the amount of work which they do if the air was pure.

Gas lights increase the temperature excessively. In the basement story of a mill 400 by 65 feet, and 15 feet high, were 456 looms on heavy colored cotton goods. The room was lighted by 457 4-foot gas burners. When these were used it was stated that the temperature increased 25 degrees in an hour. Now the room is lighted by 35 electric lights, and the increase in temperature, if any, is not enough to be indicated by an ordinary thermometer. In two other mills the rise in temperature, after lighting the gas, varied from 11 to 13 degrees.

The economy of any light increases much more rapidly than the temperature. A large gas light furnishes more light for a given quantity of gas than a small one.

Nine years ago I made some experiments upon the efficiency of kerosene burners, and obtained similar results.

The temperature of the upper carbon in an electric arc light is estimated at 6,000 degrees Fahrenheit, and the lower one at 4,500 degrees, but this estimate refers only to the special light experimented with which were used small carbons, and the general result to-day is probably greater than the one given above.

This high temperature furnishes much more light rays from a given amount of heat than a lower temperature would give.

Dr. Chas. W. Siemens, in an address delivered before the British Association in York, England, last August, stated that in a gas burner only one per cent. of the calorific energy of combustion produced light; while in the incandescent light it was three and seven-tenths per cent., and in the arc light it amounted to thirty-three per cent. Whether subsequent investigation may not modify these results is an open question, but the general statement that the electric light contains a much smaller proportion of the heat rays than the gas will be questioned.

It is stated by Mr. W. Pickering that the injurious effects of artificial light upon the eyesight are due to heat from lights, and not to the light itself.

Another matter of value in electric lights is the ability to distinguish tints. The light from the tips of the carbons is white, and the light of the arc between them is a bluish-purple, so that the general tint of the arc is that bluish-white, which has a very white appearance.

Where the use of shades of color is involved, electricity furnishes the only artificial light which can be feasibly used; and in such cases where the operation of a certain department would otherwise be limited to the duration of sunlight, the economy from the use of the electric light is, to a certain extent, proportionate to extra profits accruing from this extension of the time of labor.

In other departments of manufacturing, the aid to the production of perfect work, by this improved illumination, is a source of additional revenue, because the proportion of damaged goods usually made when the mill is badly lighted, is thereby diminished.

EXPENSE.

The cost of maintenance of a system of lighting bears little relation to its intrinsic worth. The item of cost of lighting is a small fraction of the whole operating expense, and what is desired is to light a mill so well that there will be no difference in the character of day and night work, either in quantity or quality. Any expenditure beyond that is unwarrantable.

The question of the cost of lighting by electricity is subject to many legitimate variations, of which the question of power is most variable. In a steam mill, where the dynamo is driven by the same engine that runs the mill, it should only be charged with its share of fuel, but not with any other expense of power, wherever it does not introduce any new expenditures in the way of plant, repairs, or labor in the engine room.

Some mills have departments which are only run by daylight, where work is thrown off at sundown, and so compensates for the steam required by the dynamo. For example, in one mill using electric lights, the power used in the nepping room is slightly more than is required for the dynamo, so when the machinery in that room is stopped, the dynamo can be started without bringing any extra load on the engine. Most factories are driven by water power, with supplementary steam power during the low water in the summer months; the electric lights would be required during the shorter days of the year, at a time when there is usually an abundance of water, and the extra power can be used by the dynamo by the use of more water, without requiring any additional expense.

It is difficult to make comparison between various methods of illumination, because a change of light is always made an excuse for more light.

The majority of mills are lighted with gas made by the destructive distillation of petroleum, and of about 80 candle power, which is generally reduced to 60 candle power by mixing air with it, and burned through one foot (nominal) burners, which consume about 1¼ feet per hour.

The annual cost of oil gas per burner is from seventy-five cents to one dollar. In all these estimates, interest at six per cent. forms one item in cost. One large corporation, with exceptional privileges, makes its coal gas at an annual cost of 69 cents per burner. Another corporation, inland, makes its coal gas as $1.25 per thousand feet, at an annual cost of $1.79 per burner, each burner consuming 1,433 cubic feet annually.

Of two large mills in the same city, manufacturing similar goods, the more modern one makes oil gas at an annual cost of 79 cents per burner, while the older one buys coal gas at $2.65 per burner.

Sometimes, when the gas-making apparatus is not managed with skill, the goods are damaged from soot which settles on them.

The longer time light is required, the average cost is lessened, because with the addition of operating expenses, the interest on plant, being a fixed amount, becomes a smaller proportion of the whole cost. In electric lighting, the cost of plant is so much that interest is an important item, and when the mill is run nights, the relative cost of electric lighting is materially diminished. A white cotton mill, running 60 hours a week, generally uses light 300 to 350 hours a year; where they run 66 hours a week, lights are required 400 to 450 hours a year. A dark mill requires about twice the number of lights that is sufficient in a white mill, and uses light about 100 hours a year more than a white mill.

An arc light, as generally used in mills, requires about one horse-power. Mr. James Renfrew, Jr., at Adams, Mass., has found, by test, that the 40 light Brush dynamos in his mills each require 36.6 horse power. The lights were running in a satisfactory manner, but no photometric tests were made.

The cost of arc lights in several steam mills running 400 hours per year, is 6½ cents per hour, of which 1½ cents are for carbons, and 5 cents for attendance, coal, depreciation and interest. When a mill runs nights, the hourly cost is diminished.

The ratio of substituting electric lights for gas is quite variable, being one arc light to from ten to twenty gas burners. In one mill lighted by kerosene the ratio was one arc lamp to eight kerosene lamps.

In a colored mill, one arc light will light the looms on 700 to 1,400 square feet of floor, but in a white mill the same light will be sufficient for looms on 1,000 to 2,000 square feet of floor. The reflected light from white walls and ceilings adds very materially to the diffusion.

A card room 48 by 100 feet, containing 64 cards, was satisfactorily lighted by one arc light. The end of the room was extended about 40 feet, and the light was not satisfactory toward that end of the room, because there was no end wall to serve as a reflector.

It is convenient to compare the cost of electric lighting with the expense of gas in the same place, although it must be remembered that gas does not furnish as much or as good light, and is therefore not so valuable where quality of light is of importance.

In a weave room, on very fine work, 24 arc lights replaced 292 six foot burners, which consume (292 × 6) 1752 feet per hour, so one arc light represents the consumption of (1752 ÷ 24) 73 feet of gas per hour. A careful estimate shows these arc lights to be costing 6½ cents an hour, so this arc lighting system represents gas at 89 cents per thousand. A similar estimate in another mill gives the annual cost of gas $2,188, and electricity at $1,125, or equal to gas at 90 cents a thousand. The annual saving to that mill in lighting expenses by the use of electricity makes a profit of $1,603, which represents 6 per cent. on $17,716, without making mention of any improvement in work or production due to that light. In both of these establishments the lights were used about 450 hours per year. Other estimates give the cost of arc lighting equal to gas at from 65 cents upward per thousand. In the case of incandescent lighting the cost is more difficult to estimate, because they are run at all degrees of brilliancy, affecting both the power and the life of the lamp.

Both the Edison and the Maxim lamps are guaranteed to average 600 hours; yet in the New York Post-office the average record of the Maxim lamps is stated to be 1,850 hours up to September first, and 15 lamps had already burned 3,456 hours.

The ferry boat Jersey City, belonging to the Pennsylvania Railroad, is lighted by the Maxim lights, and their record has been given to me as averging 1,645 hours, and the lamps still burning.

The data for the above was taken with lamps in use, and does not represent their ultimate endurance.

Mr. Timothy Merrick, of Holyoke, authorizes me to give the facts respecting his experience with the Edison system in the Merrick Thread Company's mill, number 3. This mill runs all night five nights in the week for fifty-one weeks per year, using light 2,869 hours per annum. It was lighted by 95 burners with city gas, costing $2.13 net, which amounted to $225 per month. 95 Edison B burners (8 candle power) were substituted for the gas. In the first 1000 hours five lamp carbons had broken, and October 20th they had been in use 1,278 hours, and 11 had broken.

Allowing that the lamps average six months' use, the cost of lighting is made up as follows :

190 lamps, at $1	$190 00
Interest and depreciation	153 50
6 H. P., at $10	60 00
Annual cost Edison light	$403 50
Monthly " "	33 62
Monthly cost gas	225 00

The results from these lamps are very satisfactory, and certainly in excess of what would have been obtained if the lamps had been forced beyond their normal capacity.

The Holyoke Water Power Company furnish water power very cheaply ; and the result may be interesting if we hold the Edison Company to their minimum guarantee ; and also charge the dynamo with four pounds of coal per hourly horse power.

4.78-100 renewals of 95 lamps equals 454 lamps, at $1.00	$454 00
Interest and depreciation	153 50
30.74 tons coal at $5.75	176 81
Annual cost Edison light	$784 31
Monthly " " "	65 36

Which is equal to gas at 65 cents per thousand.

The mill is situated at the base of a high bank, and is only eleven feet six inches between floors, so it is very hot in summer, and Mr. Merrick informed me that it would have been impossible to run the mill nights during the extremely hot season last summer, if the help had been subjected to the heat and vitiated air from the burning gas.

It must be kept in mind that an instance of a mill running day and night is an extreme one in favor of the electric lights ; but the data are given and the matter can be estimated to suit other times of operation.

The Electrical Exhibition, Royal Aquarium.

This exhibition, which is rapidly approaching completion, seems likely to surpass, in electric light appliances at all events, anything which has gone before. The chief novelty in machines will probably be the exhibit of Messrs. Ferranti, Thompson and Ince. We have on more than one occasion spoken of the Royal Aquarium as being, perhaps, the most accessible place, from all parts of London, for the purpose it is now being devoted to. As far as we are able to judge, success must be assured.—*London Electrical Review.*

The *Pall Mall Gazette* says that the making of the electrical railway between Portrush and the Giant's Causeway marks an era in the history of locomotion. If the sanguine hopes of its projectors are realized, it will be not less remarkable in the history of Ireland. Nature has left her destitute of those stores of force in the shape of coal mines, with which England and Scotland have been so plentifully favored, but she has dowered her with an inexhaustible supply of force in the shape of waterfalls, which have run to waste from before he days of Finn McCoul until now. "The costless drainage of a wilderness," which, on Canadian rivers, Mr. Hussey Vivian found busy converting, almost without the intervention of a human hand, beams of rough-hewn timber into finished doors and windows and all manner of woodwork, has never been harnessed to the service of man in Ireland. The advent of an electrical age promises to change all that, and the Portrush Railway may be the forerunner of the great things which are yet to come, when the Irish have learned to employ the drainage of their hills in driving the machinery of their mills. Turbines planted on the River Bush are to generate the electricity which is to drive the tram-cars from Portrush to the Giant's Causeway.

At the last meeting of the Royal Society a communication was made by Professor D. E. Hughes, F.R.S., on the nature of magnetism. The author propounded a theory of magnetic action which he has been led to by numerous experiments, some of which he showed to the Society. The conclusions of Professor Hughes are in his own words: "1. That each molecule of a piece of iron, steel, or other magnetic metal, is a separate and independent magnet, having its two poles and distribution of magnetic polarity, exactly the same as its total evident magnetism when noticed upon a steel bar-magnet. 2. That each molecule or its polarity can be rotated in either direction upon its axis by torsional stress, or by physical forces such as magnetism and electricity. 3. That the inherent polarity or magnetism of each molecule is a constant quantity like gravity; that it can neither be augmented nor destroyed. 4. That when we have external neutrality, or no apparent magnetism, the molecules, or their polarities, arrange themselves so as to satisfy their mutual attraction by the shortest path, and thus form a complete closed circuit of attraction. 5. That when magnetism becomes evident, the molecules or their polarities have all rotated symmetrically in a given direction, producing a north pole if rotated in this direction as regards the piece of steel, or a south pole if rotated in the opposite direction. Also, that in evident magnetism, we have still a symmetrical arrangement, but one whose circles of attraction are not completed except through an external armature joining both poles."

Electric Lights for the Bridge.

The contract for lighting the Brooklyn bridge has been awarded to the United States Illuminating Company, which is the local organization of the United States Electric Lighting Company. Seventy powerful arc lights will be distributed on both sides of the bridge, and these will all be run from machines situated on the Brooklyn side and driven by special engines. The contract includes not only the dynamo machines and lamps, wires, and lamposts, but also the engines used for driving the machines Two separate circuits are to be used which will feed alternate lamps on both sides of the bridge, so that if any accident should befall one of the engines only the alternate lamps will be extinguished. The contract calls for the completion of the work within sixty days.

A New Electric Light Company.

An application has been filed at Harrisburg, Pa., for a charter for a new electric light company, to be located at Pittsburgh. The incorporators are prominent business men of Pittsburgh, and the company is to develop the patents of the Rev. J. J. and Thomas J. McTighe, the well-known inventors, whose new form of dynamo machines are said to possess considerable merit, a description of which we shall give in next edition.

New Model of Callaud's Sulphate of Copper Battery.

Callaud's Sulphate of Copper Battery (Dumoulin-Froment Model).—In this battery, made by Messrs. Dumoulin and Froment, the sulphate of copper is placed in a glass jar, in the bottom of which there are two holes. By this arrangement the sulphate of copper can easily be removed, and the liquid be more or less stirred up, without bringing the solution in immediate contact with the zinc. The piercing of the two holes can be easily done, and at very little cost.

The positive pole is formed by a copper wire, rolled in the shape of a spiral at its lower end, and consequently is without weld, solder, or any possible break in its continuity. A protection of rubber, sufficiently thick, formed by a simple tube slipped over the end of the copper wire, covers it from the bottom to outside the outer jar. The zinc is suspended by two hooks, which are simply passed through two holes made in the top of the jar, and which rest on the edge of the outer jar.

This battery has one peculiarity which can be of a certain use as regards attending to it—namely, the difference generally noticed between the level of the liquid inside and outside of the glass jar. If the battery is in good condition, the liquid in the jar is lower than that with the zinc, thus showing that the solution of sulphate of copper is concentrated, or nearly so, and that of zinc sulphate is not so; this case proves the battery to be in good working condition. If, on the contrary, the heights of the liquids are equal, or even if the sulphate of copper should be higher than the other, it is because the copper solution is not concentrated enough, or that the sulphate of zinc solution is overcharged with salt.

The constants of the battery thus made do not differ at all from those of the ordinary callaud (E = about 1 volt, R = 6 to 8 ohms), because the positive pole is always kept in the solution of sulphate of copper, which escapes from the jar through the two holes.

Atlantic Cables.

For some time past there has been a new Atlantic Cable Company rumored, but no definite steps have apparently been taken to proceed with the manufacture and laying of more cables. This threatened opposition was based on the supposed control by one company in America (the Western Union Company) of the existing cables. In order to do away as far as possible with this notion, an independent marine telegraph office is about to be opened in New York. The Direct United States and the French Atlantic cables will be worked from this office, quite independently of the existing land lines in America, and at the same time will be open to receive messages from any of the land telegraph companies of the United States. As the existing cables, thanks to the duplex system of working, are sufficient for a much larger traffic than there is at present, it is probable that the new office will obviate the necessity of laying more Atlantic cables for a considerable time to come. While upon this subject, we may mention that Dr. Muirhead has just successfully "duplexed" the Jay Gould Cable across the Atlantic.

A Throat Electric Lamp.

At the last meeting of the Leeds and West Riding Medico-Chirurgical Society, Mr. Margetson, of Dewsbury, England, exhibited an incandescent lamp, designed by himself, and used by him since October last in examining the mouth and throat. The globe was about half the size of a walnut. It can be held in the mouth for two minutes without discomfort from the heat.

REVIEW
OF THE
elegraph and Telephone,
(AN ELECTRICAL JOURNAL)
PUBLISHED SEMI-MONTHLY AT 23 PARK ROW.
P. O. BOX, 6629.

). WORTHINGTON, - - *Editor and Proprietor.*

SUBSCRIPTION.

Jnited States and Canada, $2 00 per annum, in ance.
Great Britain and other foreign countries, $2.50 = = 13 francs, in advance. Postage free.

ADVERTISING.

Transient rate, 35c. per line each insertion.
"Business specials," 50c. a line.

EDITORIAL ANNOUNCEMENT.

We invite correspondence from Electricians, Inventors d the Telegraph and Telephone fraternity on matters taining to electrical and scientific subjects, and all facts pecial interest in connection therewith.

Those desiring to recommend their goods can do so to y extent in our advertising columns, but we will not blish for pay anything of that nature in our reading umns.

Subscribers can at any time have the mailing address their paper changed by sending both old and new dress. Wm. Dawson & Sons, 121 Cannon Street, ndon, England, are our accredited representatives Great Britain.

The Editor does not hold himself responsible for opin- s expressed by his correspondents.

No notice is taken of anonymous communications.

DEALERS SUPPLIED WITH THIS PAPER BY

e American News Company, New York.
e American News Company, Denver, Col.
e American News Company, Kansas City, Mo.
e American News Company, St. Paul, Minn.
e New York News Company, New York.
e New England News Company, Boston, Mass.
e Central News Company, Philadelphia, Pa.
e Western News Company, Chicago, Ill.
e St. Louis News Co., St. Louis, Mo.
e Cincinnati News Company, Cincinnati, Ohio.
e Pittsburgh News Co., Pittsburgh, Pa.
e Baltimore News Company, Baltimore, Md.
e San Francisco News Co., San Francisco, Cal.
e Montreal News Company, Montreal, Canada.
e Toronto News Company, Toronto, Ontario, Canada.
m. Dawson & Sons, London, England.
N. Duquet, Quebec, Canada.
A. Kramers & Son, Rotterdam, Holland.
rthold Mendel, Berlin, Germany.
D. Osborne, Calcutta, East India.
Knauff, Moscow, Russia.

NEW YORK, MARCH 1, 1883.

CONTENTS.

The Patents of Augustus Hahl and Elisha Gray Upon Elevator Annunciators.

The Hahl patent was issued March 10, 1874, while Gray's application was pending in the Patent Office. Interference was afterwards instituted between Hahl's patent and Gray's application, which resulted in favor of Gray as to the broad principle of an electric annunciator traveling upon an elevator car, and means for signalling from the different floors while the car is in motion.

Gray, however, conceded priority of invention to Hahl upon the specific device of a flexible or folding cable, which has been adopted generally.

These patents are both owned by the Western Electric Company, and several suits have been brought upon them in St. Louis, Chicago, and New York. In these suits the defendants have settled or ceased to contest the matter before the final hearing.

In May, 1881, the Western Electric Company brought suit against the Chicago Electric Manufacturing Company. This suit was contested vigorously to the end in the Circuit Court for the Northern district of Illinois, and was decided in favor of the validity of both parties by Judge Blodgett.

The opinion rendered December 26, 1882, is published in full in the Federal *Reporter* of February 6, 1883. The Court, after defining the inventions and reviewing the interference proceeding which were had in the Patent Office, continues as follows:

"These concessions and disclaimer left the Gray patent covering only the general principle of connecting the annunciator in the moving car of an elevator with signal keys on the respective floors of the building and the battery by the means shown, but conceded priority of the flexible cable method to Hahl.

"The defense of want of novelty rests mainly on the patents of Holmes and Corey for similar devices, and the analogous devices of Foster and the gas tube, by which gas is carried by means of a flexible tube to burners in an elevator car.

"As to the Holmes and Corey patents, it is sufficient to say that they were put in interference with the Hahl patent before the Patent Office, and the commissioner on proof decided that the invention of Hahl was prior to that of either Holmes or Corey. This decision of the commissioner may not be so wholly conclusive upon all the world as to prevent the citation of the devices of Holmes and Corey as anticipating the Hahl patent, but no proof is introduced on this trial which was not before the commissioner, on this interference, and it seems to me there can be no doubt that the decision of the commissioner was correct upon the testimony in the matter then before him, and that his award of priority to Hahl sufficiently disposes of the Holmes and Corey devices for the purposes of this case.

"The Foster patents are for devices for transmitting signals by means of pneumatic tubes.

"Neither of them show the application of the device to an annunciator in the car of an elevator while in motion, and even if they had shown such application to the Foster device I do not think a person could, without invention, from any hint or suggestion in the Foster device, by mere mechanical skill, adapt the system of electric calls used in Hahl's device to an elevated car. The same may be said of the flexible gas pipe.

"Neither air, working through a flexible pneumatic tube, nor gas, passing through it for the purpose of illumination, is the electric fluid, and it required something more than was done, either by Foster with his pneumatic tube, or whoever applied the gas tube, to apply electricity to the operation of an annunciator in a car in motion.

"The proof shows that since the Hahl and Gray patents, this device has been generally adopted for use in elevator cars, and its adoption, and the fact that almost simultaneously quite a number of inventors, two of them at least, Gray and Holmes, well known to the public for valuable inventions in the field of electric science, had given their attention to the subject matter, covered by the devices now before us, is evidence that it required something more than mere mechanical skill to accomplish the result attained by this patent.

"As to the second point, that this device shows only a mere aggregation of parts and produces no new result, it is sufficient to say the result produced is the transmission of signals to a car, *when in motion*, which was new and had never been produced until this combination, and that some of the parts in this combination perform a new function, and the whole combination produces a new result.

"As to the objection that the Gray patent was irregularly issued, it is, perhaps, not material to the purposes of this case to consider that point seriously, because the defendant in this case is shown by the proof to only use the flexible cable method, covered by the Hahl patent; but I have no doubt that under Section 4,904 of the Revised Statutes the Commissioner of Patents had the right to declare an interference between Gray's application and the Hahl patent, as the statute expressly gives him the power to declare an interference between 'any pending application and any unexpired patent.'

"So, too, it seems to me that both patents are sufficiently definite in their statements to describe and cover the inventions claimed.

"There is no controversy in this case on the question of infringements.

"The proof shows that the defendants have used, and are using, the flexible cable method shown and described in the Hahl patent.

"I can, therefore, see no reason why the complainant is not entitled to a decree and to an accounting."

Electrical Energy.

[*Continued from page* 4.]

Numerous attempts were made, after the announcement of Volta's invention, to improve the form and action of the apparatus. These endeavors have continued, with more or less success, to the present day, of which the storage of electical energy is an instance.

Two months after the announcement by Volta of his invention, Messrs. Nicholson and Carlisle decomposed water its constituent gases by means of Volta's pile.

In 1801, Dr. Wollaston pronounced that the oxidation of the metals in a voltaic pile is the cause of its electrical effects; later in the same year, he turned the power of an electrical machine into a continuous current while decomposing water by frictional electricity.

In 1801, Gautherot observed the action due to polarization on which electrical storage is supposed to depend.

In 1802, in the very infancy of voltaic electricity, an *artificial magnet* was employed to decompose water in place of the direct galvanic or voltaic current. This is of interest in connection with the employment of magneto-electricity in charging accumulators.

In 1803, Ritter, of Jena, devised a secondary battery making use of the currents due to polarization. When an electric current is sent through acidulated water, with platinum plates as electrodes, a film of oxygen covers the positive electrode, and a film of hydrogen covers the negative electrode. One of these two substances being electro-positive and the other electro-negative, they act in the liquid like two different metals; the hydrogen plays the part of zinc, and the oxygen plays the part of platinum.

Withdrawing the charging battery and connecting the two plates thus covered with films of gas, by a conducting wire, an electric current is obtained. The direction of this current is from the hydrogen film to the oxygen film through the conducting wire.

Two electrodes thus covered with condensed gaseous films are said to be polarized.

When a cell with platinum plates is introduced into a voltaic circuit it is found that the battery-current, though strong at first, gradually weakens. This is due to the opposed current of polarization.

The electro-motive force of the film-covered plates is in the opposite direction from the current charging them, and may be far greater than that of the battery charging them. It may give a more brilliant spark and overcome resistances insuperable to the charging battery.

This form of battery was discovered by Ritter. Rome writers accredit the invention to Gautherot in 1801, as consisting of a phial containing salt and water, with a stopper through which passed two silver wires. Gautherot was followed by Erman, a German, who was in turn followed by Ritter of Jena.

In 1805, Brugnatelli deposited gold on silver medals by voltaic action by immersing them in ammonurate of gold.

In 1812, Zamboni constructed a pile of alternate layers of tin foil, paper and peroxide of manganese.

In 1826, Nobili, by the electrolysis of a solution of the acetate of lead, deposited peroxide of lead on plates of metal.

In 1833, Faraday set the whole theory of storage of electrical energy on a firm basis in a series of papers communicated to the Royal Society. He said that "the decomposing action of a current is constant for a constant quantity of electricity, notwithstanding great variations in its sources, in its intensities or in other circumstances." He showed by numerous experiments that electricity and chemical affinity are the same force differently modified; by showing that the amount of decomposing effects in all substances agrees with their chemical equivalents. To those not acquainted with the nature of chemical combinations it may be desirable to state that the elements of bodies always unite in definite proportions. For instance, eight atoms of oxygen unite with one of hydrogen to form water, and one atom of oxygen unites with five of potassium to form potass.

The eight parts of oxygen which combine with one of hydrogen to form water combine in the proportions of 32 with copper, 58 with tin and 103 with lead; and the same amount of electric force that is required to separate 8 parts of oxygen from water will, by secondary action, separate copper, tin and lead from their combinations with oxygen in the proportion of 32 with copper, 58 with tin and 103 with lead.

Faraday carefully collected the results of the action of a zinc plate and a plate of platinum in dilute acid.

The quantity of oxygen and hydrogen evolved showed the amount of water decomposed. The weight of the zinc plate was diminished, and the weight of water decomposed, as 9 is to 32.31; these numbers correspond with the equivalents of water and zinc.

In 1837, Schonbien, of Basle, announced the fact that plates coated with peroxide of lead possessed electro-motive qualities.

In 1840, Murray deposited various metals on carbon surfaces by galvanic action.

In 1841, Alfred Smee enunciated the laws regulating the character of metallic deposits by galvanic action.

In 1842, Grove invented his gas battery. This arrangement consisted of platinized plates enclosed in tubes, and arranged in pairs. One plate of each pair being surrounded with oxygen gas and the other with hydrogen gas, the lower extremities of the plates being in acidulated water.

[*To be Continued.*]

It is stated that the Swan United Electric Light Company, of London, have sold to the Russian Government, for £100,000 in cash, the exclusive right to use their invention throughout the Empire, and to sell their lamps. There can be but little doubt that the employment of the electric light in the larger cities and towns of Russia could be made a most lucrative State monopoly. The company's paid-up capital is £160,000 in 80,000 shares.

The Bell telephone appears to be rapidly triumphing over its competitors. A suit which has attracted much attention has just been decided in its favor in England in the Court of Appeals after a hard fought legal battle. The trial in the lower court before Mr. Justice Fry occupied sixteen days, and in the Court of Appeals before the master of the rolls, Lord Justice Lindley and Lord Justice Bowen, it occupied nine days.

The United Telephone Company, owning the Bell and Edison patents sued to restrain an infringement of their patents. The defendants maintained that Bell was not the inventor of the telephone; that a German, Herr Reis, in 1862 published in a German scientific journal an illustrated description of an instrument invented by him for the reproduction of musical sounds by electro-magnetism, a copy of which journal found its way to the library of the Institute of Civil Engineers in England. Second, that the invention of Mr. Bell had been exhibited, and so published, in England, by Sir William Thomson, of Glasgow, shortly before the date of the patent; and, third, that the specifications of Mr. Edison's patent for a transmitter, involving the principal of the microphone, were improperly drafted, claiming the phonograph also, which was not comprised in the provisional specifications,—a fatal fault under English law. The decision in the inferior court was for the plaintiffs on all points except that regarding the Edison patent, and both parties appealed. There is, however, a provision of English law enabling an inventor to enter a disclaimer of a part of the title or specification so as to save a patent. This was done in the present case, and the sole question before the Court of Appeals was the validity of the Bell patent.

The result of the trial was, as stated above, a triumph for the Bell telephone and its owners. It was held that the invention of the Reis instrument, or toy, had been published in England, but that it was so different from the Bell instrument that such publication could not be considered an anticipation of the latter. The instrument exhibited at Glasgow was made by Mr. Bell. In 1876, when Sir William Thomson was in attendance at the Centennial Exhibition in this country, Mr. Bell exhibited his telephone to him, and gave him an instrument to take home. At the next meeting of the British Association, Sir William Thomson spoke enthusiastically of the invention, and exhibited the instrument given him by Professor Bell, although he could not make it work, nor could anybody else. This was before the English patent was secured. The court held that this was nevertheless a publication, and the decision would have gone against the owners of the Bell patent but for the fact that the instrument actually patented contained improvements upon the instrument then exhibited of such importance as justified holding the patent good.

Thus the Bell telephone holds its own in England as in this country. There have been some big fights over it in both countries, and there will be more, for it is well worth fighting for.

We extract from the Brooklyn *Eagle* some exceedingly interesting remarks upon electric light matters by the able contributor who signs himself "F. H. N.:"

Dr. Siemens, speaking of the cost of electric light, (incandescent principle), says: "From the experience of large installations, I consider that electricity can, roughly speaking, be produced in London at a cost of about one shilling per 10,000 Ampere volts or Watts (746 Watts being equal to one horse power) for an hour. Hence, assuming that each set of four incandescent lamps in series required 200 volts electromotive force and 60 Watts for their efficient working, the total current required for 64,000 such lights is 19,200 amperes, and the cost of the electric energy lost by this current in passing through 1-100th of an ohm resistance is £16 ($80) per hour."

"At Brunn, in Lower Austria, a theater has been lighted with fifteen hundred lamps, each having an intensity of sixteen candles. At Holborn three machines, each capable of furnishing one thousand incandescent lamps, have been placed in position, and unusual success is being had. The lamps in use, however, which, it is claimed, have a minimum life of one thousand hours, are said to cost three shillings. From this a high authority calculates that the cost of lamps alone will amount to one-half that of gas, which, it is said, will give a like intensity of light at three shillings the thousand cubic feet. There is a very important point, however, in this incandescent system of electric lighting as developed by Edison that many are apt to overlook. That is the transmission of power over the same wire or through the same electric main whence comes the current for lighting purposes. In the district whose boundaries have already been given, innumerable small steam engines are used for running elevators and working shafts. Now, it has been demonstrated that an electrical force equal to, say, ten horse power, may be economically transmitted a short distance—say a mile's length, perhaps more. Each of these small engines, beside its first cost and interest on the money expended, etc., requires the employment of an engineer. For a tithe of this expenditure, if Mr. Edison's expectations are not too sanguine, the required power may be transmitted through an electric main. To be sure, this power must first be generated by means of the combustion of coal at the central station, but there it is generated in immense boilers and through engines of large dimensions. But these engines are required to work the dynamo-electric machines that supply the light at night, and would lie unemployed through the daytime if power was not also needed. Now, even admitting that electric lights are more expensive than gas jets of the same intensity—and that this is true when electricity is generated on a grand scale has not yet been proved beyond peradventure—even admitting this, the amount received for the auxiliary supply of power over the same wires during the day-time that supplied the light by night would go far, if it did not entirely eliminate this extra cost, and enable the light company to reduce the charge for light below actual cost.

The continuous and often unnecessary use of technical terms by those who essay to describe electrical discoveries and improvements, even in popular publications, prevents many who would otherwise be interested in the subject, but have not the time at their disposal to master the technicalities, from keeping themselves abreast of the times.

In an article recently published in a popular periodical, which had substantially for its theme the question as to whether or not carburetted hydrogen gas, such as is generally used, was to be preferred to the electric light, the author—no doubt an able man in his specialty—produced a perfect labyrinth of inextricable mazes of technical explanations. Such expressions as molecular tensions, molecular disturbances, photo metric tests, and so forth, seemed to

peep out from every line; but when he said "You will readily perceive that the Nth power of" so and so is equal to so and so, no doubt most readers laid down the publication in despair, and, as the author, so far as they could see, came to no conclusion as to which, gas or the electric light, was to be preferred, knew no more of the subject in question than they did before.

Such an explanation reminds one of a case said to have been tried recently in a Georgia court. A negro, having discovered a lost coon in the possession of another negro, had him arrested for petit larceny. After hearing the evidence on both sides, the learned judge rose majestically, and thus decided the point of law: "At common law this yer animile was per sonal property; but, inasmuch as the law conceives that everything attaches to the land, it would not be larceny, independently of the statutes, to sever and carry away, with felonious intent, a animile from a tree or from a barn. But, if this yer animile were severed at one time and carried away at another, after an interval of time, a larceny would be committed; for the property would become by the severance the personal property of the owner of the realty, and rest as such in his possession before the asportation."

"Dat's all wery well," said the plaintiff, after he had patiently listened to the learned dissertation, "but what we wants to fin' out is, who gets de coon!"

There are, however, some terms whose significance it is absolutely necessary to understand in order to fully comprehend descriptions of mechanical appliances of the electric current. The most important of these are the terms work, energy and potential. Work, in its physical sense, might not inappro priately, perhaps, be described as that capacity for doing something that can be measured. We will suppose that a laboring man has been employed to cut a trench through a field. In a certain time, and under certain conditions, he will have performed a certain amount of labor that can be measured, and he will exhibit a certain amount of exhaustion. Or let us suppose a stout-bodied lad to set himself to the task of throwing a given number of cricket balls just as far as he can. The first he throws, we will say sixty yards, the second less, and so on, until he reaches the last, and is so fatigued with his previous efforts as to be unable to throw it but a short distance.

The great tidal streams throughout the country, or that generated at the coal mines, where fuel is cheap, could be transmitted hundreds of miles and sold for a mere song. In an address delivered in Glasgow some years since, Professor Siemens, the eminent electrician, said that in England a means of transmitting power by electricity must soon be the all-important question of the day. "What are the English to do," he inquired, "when their coal is exhausted?" Of Niagara Falls, he said, "the amount of water falling over Niagara is equal to 100,000,000 tons an hour, falling 150 feet. The amount of coal required to raise such a weight up to the point from which it fell, which is a measure of the amount of power yielded by that water in falling, would require the consumption of 260,000,000 tons of coal, which is the amount of coal now consumed by the entire world. Now, if fifty per cent. of the power used to drive the first dynamo machine could be re covered from the second, and hence if the whole power of Niagara could be utilized, it might be distributed over the United States so as to give from that waterfall alone a power equal to the present entire mechanical force of the world, estimating that one-half the coal used is solely for mechanical purposes. The means by which Professor Siemens would draw the power from the falls would consist of a series of flumes from the edge of the descent of the American Falls to the level of the water below of a size large enough to carry the waters of the Niagara River through water wheels.

At the present state of efficiency of the transmitting machines, such an enterprise would, of course, be out of the question; but such a consummation would not be more extraordinary in the future than the transmitting of a mechanical movement by electricity, as is accomplished in the telegraph, was in the past.

But the dynamo electric machine, in its present state of efficiency, is capable, as has already been said, of utilizing the power of a running stream toward lighting with electricity the towns that lie adjacent to it. Already the town of Godalming, on the River Wey, in Great Britain, is thus being lighted. Coal is here very expensive, since it must be brought from a great distance. Mr. Alexander Siemens, referring to this scheme in a letter, says that they had some difficulty with the stream driving their water wheel at first, owing to floods, but that with the assistance of a small steam engine, working as an auxiliary, they have succeeded in working the light very satisfactorily, having seven large voltaic arc lights and 300 small incandescent lights in use, the water power doing the major portion of the work. The only difficulty experienced in this instance was irregularity in the light, owing to irregularities in speed. Doubtless, when they get their turbine wheels in position, with adjustable sluices for regulating the quantity of water flowing in, all this will be rectified, and they will be enabled to dispense with the services of the auxiliary engine altogether. In a country like Ireland, for instance, where coal for the most part must be imported, the power transmitting machine must in the future prove of inestimable value. Her water power, which, as estimated by Sir Robert Kane, amounts to one million and a quarter horse power, may, through the agency of this machine, be distributed through the country in the shape of electricity, and supply her mills with power and her cities and villages with light and even heat, instead of being as now permitted to run uselessly to waste.

Take, for instance, the case of Dublin, which has canals on both the north and south sides. Low pressure turbines could, and no doubt will, in the near future, be established so that they will drive dynamo electric machines, through the instrumentality of which the whole city will be lighted. In the mag neto electric machine the field is produced by the presence of a powerful permanent magnet consisting of several pieces of steel that have been magnetized. In the dynamo machine the magnetic field is produced by an electro magnet which itself is excited by the currents it generates. These are produced by what might be called an accumulative action. One current sustains and increases another, and when all act simultaneously on the electro magnet they serve to increase the total effects until the iron is saturated with magnetism. These generators as has already been said, may be worked by a steam engine, in which the energy of the coal, or at least a small part of it, is turned into steam and the steam is turned into electricity, or the generator may be worked by water power. At Craigside, near Newcastle-on-Tyne, where Sir William Armstrong lives, the power of a stream near by is turned into electricity by the interposition of an electric generator and the house is lighted, as its owner says, "by the river running through the grounds."

The storage batteries of Plante, Brush and Faure, though their present efficiency has, perhaps, been greatly exaggerated, will doubtless in the future play a very important part as adjunct to the electric generators, if not as an independent electric distributors.

The idea, however, that the storage and secondary batteries or electric accumulators hold the currents with which they are charged until such time as they are needed, is a mistaken one. Electricity, as every one knows, is one result of chemical action. When the current passes through the battery a chemical action results until the incoming current ceases, at which time a reverse chemical action takes place which produces electricity.

The future possibilities of these secondary batteries seem to be almost unlimited. Practically speaking, it might be described as the missing link that was needed to insure the dynamo against accident, even if it served no other purpose. For wherever machinery is used, and it is necessary both where the dynamo is worked by steam and water power, there are likely to be occasional breaks, and the secondary battery is kept charged and in juxtaposition to the dynamo may, for a time, at least, take its place in distributing the electric current, thus giving time for necessary repairs. The value of such service, especially where light is being supplied, may readily be seen. In the City of New York, for instance, we have seen the arc lamps which supply certain streets with light, suddenly grow dim and the section they essayed to light, remain in darkness for a portion of the night. Such accidents rarely happen in the use of carburetted hydrogen gas, and the advantages of the latter as a constant illuminant, would be greatly increased in comparison, were it not for the fact that the secondary battery is expected in the future to make the utter extinguishment of these lights a rare occurrence.

Western Union Plans for the Transmission of Messages Over the City.

The lease recently made by the Western Union Telegraph Company of the large building on the southwest corner of Fifth avenue and Twenty-third street is the first step in the material improvement of the company's service in this city. The large building at Broadway and Dey street, which contains the head offices of the company, is the great center of telegraphic communication. Hundreds of wires stretch out from it to all parts of the country and to the thirty branch offices in this city. The operating room, which extends over the entire seventh story of the building, is a great receiving and distributing reservoir of messages. Despatches from out of town are received there and telegraphed again to the branch offices nearest to the street numbers to which they are addressed. The branch offices in turn pour all their contributions into this room for transmission. The city system includes hundreds of miles of wire, the use of which is at times interrupted by storms and by contact with other wires, and by fires. Frequently the local business is too great for the wires. The expense of operating also, is a considerable item.

A few years ago Gen. T. T. Eckert, the Vice-President and General Manager of the company, made a study of the pneumatic tube system of London, and became convinced that it was practicable in this city. The first experiment was made by connecting the Stock and Cotton Exchanges with the main offices by pneumatic tubes. The result was exceedingly satisfactory to both the company and its patrons. The service was performed more quickly, greater accuracy was secured by avoiding retransmissions, and expenses were diminished. The next step was to connect the main office of the company with the offices of the newspapers belonging to the Associated Press. The company now proposes to increase its pneumatic tube service, and partly to that end has leased the building mentioned.

To be Consolidated.

The Mutual District Telegraph Company and the District Telegraph Company, of Boston, are to be consolidated at an early day. Mr. D. J. Hearn, of the former company, has been offered the position of superintendent for New England, of the new concern.

Telephonic.

Electric Eccentricities.

Sometimes a vague conviction of uncertainty, founded chiefly in the unsatisfactory outcome of treasured theories, will steal over the wisest minds and set them a wool gathering, and so it cannot be startling that colts in the wide pasture of matters electric should occasionally lose their bearings and grope around for a little light.

Possibly the feature of intensest interest surrounding the science is the delightful "go-as-you-please" manner in which many of its teachers treat the same subject; and, whilst scores of instances could be cited to prove this position, it will probably suffice to mention the failure of a recent electric congress to determine the value of an ohm, a value that seems fixed and immutable in the primer of electric engineering.

However, this is not intended as a philosophical dissertation, and the sooner we come to the core the happier for all concerned.

It is generally supposed that trees, branches and even leaves, when they come in contact with a charged wire, will inveigle and convey away a certain portion of the current, and so far as heavily saturated telegraph wires are concerned, a very small limb has been known to demoralize a very long circuit.

A sane electrician would hardly be so careless as to allow many limbs to touch his wire and expect it to work, certainly not unless they were exceedingly inaccessible, and in that case he would not by any means effect ignorance of the cause when he found it necessary to double his battery, at least not to himself.

But when we come to a telephone wire the conditions seem to be changed, or at least not thoroughly understood.

It has been suspected that the use of induced or magneto currents might have something to do with these peculiar conditions, and doubtless, as evidence becomes more available, some of the preconceived notions upon the subject will have to be materially modified.

The disuse of insulators upon many telephone lines has already become a phenomena of progression in the art, and there may be much to be learned upon the same subject in the near future.

These items may help a little.

A line six miles long was recently constructed in south-west Texas connecting the two ranches of a large cattle farm.

A route had been surveyed through the dense live oak, mesquite and hackberry (all are bad for telegraph lines), which it is intended to cut out in the course of time freeing the line, but at present the entire line lies and cuts into the tops of these trees in thousands of places, and they were all green when the wire was placed.

Now these bells ring out at either end clear and loud, and as for talking, if the subscriber who "never gets no connections no how," could stand and listen, his ears would tingle with unsuppressed delight.

Another case.

A line runs from the central office in San Antonio to the Government depot, two and one-half miles distant, and is grounded to the common supply water-pipe of that suburb with a number eight copper wire soldered securely of course.

The wire is of number 14 steel. About one hundred yards from the depot the wire forks and runs, say, one hundred and fifty yards further to the quarters and is grounded to the same water pipe by a somewhat smaller copper wire.

We will call the exchange *A*, the depot *B*, and the quarters *C*.

Now according to the theories upon this subject, when *C* rings he will get *B* of course, and it should seem that *A* would not get enough current to simulate a taste, but the fact exists that he rings up *A* at the same time, that no switch is necessary and the talking facilities between all three are in no wise reduced.

That the theory is correct in the main, can hardly be doubted, else the exchange would ring up many subscribers when only one is wanted.

Careful investigation in this case furnishes no reason for calling into question the perfection of all details.

One more instance may not be amiss.

A wire was run some three hundred yards from the exchange and properly grounded at the subscriber's place of business, the bells rung all right at either end and through to each other, but whilst the subscriber had no difficulty in hearing the exchange the latter could not get a syllable from the subscriber.

Of course there are many ways of accounting for this, but in view of the consideration that the subscriber's battery was in good condition, and that the resonant rumble in the transmitter was on time, except when the main line was disconnected, the limit of possibilities, the average inspector will suspect, was somewhat circumscribed, and in truth it resolved itself into contact with a tin gutter somewhat nearer the exchange than the subscriber.

This latter fact, however, adds nothing to the lucidity of the topic.

Referring to the first instance, the conclusion is inevitable that a line could be strung upon trees for possibly fifty miles or more and would still be available for telephonic purposes, and it can hardly be questioned that as experiment brings confidence, the mind of the military electric engineer of the future, to say nothing of others who may find themselves in an urgent strait for rapid communication, will not be perturbed by the absence of insulators, provided his carpet-trunk is well supplied with plenty of light wire and a pair of gutta-percha tubes. J. K. D.

San Antonio, Texas, Feb. 15, 1883.

Telephonic Progress in Canada.

A Montreal contemporary states that the Bell Telephone Company has at the present, telephone offices in about 100 towns and places in Canada, and employs a staff of more than 250 men, the number of subscribers amounting to 4,250. The company possesses at Montreal a large factory, where all the instruments and apparatus used in Canada, are manufactured. The number of subscribers in the principal towns is as follows: Montreal, 866; Toronto, 525; Hamilton, 320; Ottawa, 250; St. John, N. B., 275; Winnipeg, 250; Quebec, 240; London, 230; Halifax, 170; Victoria, B. C., 130. During the last year the company laid nearly 1,000 miles of telephone lines.

THE TELEPHONE IN ITALY.—On the 31st ult., there were in use in Rome, 651 Telephones; in Turin, 454; Naples, 413, and in Milan 390.

The annual meeting of the New York Electrical Society will be held in the rooms of the society in the Metropolitan T. and T. Building, corner of Greenwich and Liberty streets, on Friday evening, March 2. Among the business to be transacted will be the election of officers and standing committees for the ensuing year.

The Problem of the Telephone.

That the American Bell Telephone Company is master of the telephone field must be acknowledged. Every telephone user knows it. Every would-be user knows it. Every telephone inventor knows it. The recent consolidation of telephone interes massing of capital, the successes in court, have this company a tower of strength. With a cap $10,000,000, swelled by premiums to $18,0(with legal advisers, and experts schooled in t of telephony from the beginning, and with ju prejudice in its favor, it appears futile for a to attempt a contest with so powerful an opp If the claims of the Bell patent are to be constru every court as covering any and all methods of mitting speech electrically, then telephone inv must be content with the bare possibility of dis of their inventions to the controlling power; on the other hand, the Bell patents are found to only a specific method and apparatus for transm speech, then there is a field in which inventor work with prospects of a reward.

It is held by some that the Bell patent covers the method of and apparatus for transmitting s electrically by means of undulatory currents o tricity. It is held by the Bell counsel and e that there can be no other method, while it is cl by others that another method and other app may be employed to accomplish the same en all these phases of the telephone problem there questions for which there is now no answer. most intricate points of law as well as the mos tile physical principles are involved; and no question is, as to the advisability of pursuin phone investigations for purely monetary con tions. Any one familiar with the present sta telephonic apparatus can readily see that there greater field for study, and none that has g promise of profit in it, than that of telephone tion.

Let the legal aspect of the matter be as it ma positive that the accomplishment of certain im ments in the telephone would yield a far riche vest than has been reaped by any inventor in thi It should be no source of discouragement determined and intelligent inventor that hun and probably thousands, have reached towa prize with a grasp too short, for it is only a fa index of the great value of the prize that so have striven for it.

The results to be attained are continuity, un ity, and reliability of action, increased volu sound, freedom from external disturbances, inc distances, and better service for less money. all this is to be accomplished we shall not atten suggest, but a few of the obvious things to be are to reduce the delicacy of the apparatus, crease the current used on the line wire and to current of lower potential, and to isolate the tele wires from other line wires carrying heavy cu

Why should not the telephone speak out ordinary conversational tone, and why should be spoken to in the same tone, without the ne of being near the instrument? Why should r distance over which conversation is carried on telegraph distances? Of course, we know tha tricians and physicists have struggled with problems, but what are the results?

If we are to have a long distance telephone, duction coil must be discarded, because the sec current avails itself of every avenue of escape its conductor, and everything with which it into contact—the insulators, the air, even cont wires—rob it of some of its strength, so that tempting to communicate by telephone ove lines the current is lost, little by little, at ever lator, and all along the line until it is finally i cient to affect the receiver.

If a battery current of the strength used in raphy be employed, evidently something l carbon must be used for electrodes in the trans or the instrument under some conditions might an electric light instead of transmitting speech.

Some are of the opinion that speech can be

ed by means of an interrupted current on a ken circuit. If this is possible, a proper appor- ment of the periods of contact and periods of ration of the electrodes of the transmitter should e increased volume of sound, and permit of the of a battery current on the line.

he fact that more than five hundred patents have n issued for telephonic improvements will natur- discourage inventors, but let the student of tele- ny consider that there is a great similarity between y of the telephone inventions; that the variations mostly structural, and not in principle; that the ority of inventors are wedded to certain accepted ories; and finally, that most if not all of them are he same groove, and that to obtain new results e must be a radical departure from the reigning ; then he will look for means and methods differ- from those of his predecessors.

n what the telephone of the future will consist we not predict; but it should be capable of talking being talked to, as one person talks to another; a man in New York should be able to transact iness orally with another in Chicago or San Fran- o.—*Scientific American.*

he annual meeting of the National Bell Telephone npany of Maine was held at Lowell, Mass., last k. The report of the Treasurer showed that the pany had connected January 1, 1883, 3,708 sub- bers, a net increase of 803 made during the year 2.

he subscribers are distributed as follows:

Augusta	172
Bath	103
Bangor	220
Biddeford	67
Boothbay	20
Calais	54
Fitchburg	260
Lewiston	230
Lowell	950
Portland	710
Rockland	42
Waterville	40
Worcester	826

he company has a total of 2,243 miles of wire. net earnings for the year were $86,931.96, of ch $59,298 has been paid out in dividends, leaving rplus of $27,633.96, which, added to surplus on d January 1, 1882, $9,710, makes a surplus to e of $37,343.96. It is predicted that the increase 883 will exceed that of 1882. The following ers were elected for the ensuing year: W. A. ham, President; Charles J. Glidden, Treasurer Secretary; Loren N. Downs, General Manager, ell; Franklin J. Rollins, Clerk, Portland, Me.

uring the month of January the telephone com- ies handled 21,158 extra-territorial messages, as ows: Union, 1,144; National Bell of Maine, 0; Bay State, 7,333; Boston and Northern, 31.

Telephoning by a Beam of Light.

Prof. Alexander Melville Bell, father of Mr. xander Graham Bell, the inventor of the Bell phone, and his brother, Mr. Charles James Bell, Toronto, Canada, have been in the city since nday. In the course of a half-hour talk yesterday f. Bell was asked :

'If the question may be allowed, Prof. Bell, is it e that Mrs. A. Graham Bell is a deaf mute?" he is, and yet she talks almost perfectly. You uld never know she were deaf if you met her. af mutes are dumb only because they are deaf. ere is no local defect to prevent utterance. When y know how to control their vocal organs they articulate with comparative facility. While engaged in teaching the visible speech to 2,000 pupils in Boston, my son made the experiments which led him finally to the sending of audible words through the electric wire."

"The popular impression is that the sound is in some way conveyed over the wire, just what is the fact ?"

"The fact is, that it is a beautiful example of the convertibility of forces from one form to another. Thus, you give the first vibratory mechanical motion of the air which is imparted to the membrane carrying the iron. This motion is converted into electricity in the coil of wire surrounding the electro magnet, and at the receiving end is first effective as magnetism, which is again converted into vibratory motion at the iron armature, which motion is imparted to the air, and so receives again a sound wave in the air like the original one."

"I have heard sounds conveyed by a beam of light," said the Professor.

"Articulate sounds ?"

"Yes, words. No practical application has yet been made of this, but there will be."

We do not have sunshine enough for this to be any special value in Cincinnati, but the reportorial instinct was aroused, and the question, "How did you manage it ?" followed.

"It was in Boston. The wires were stretched from the top of the Institute of Technology to some other high building, the name of which escapes me. The sun's rays were received in a parabolic reflector. My son spoke against the back of a diaphragm, the front of which was silvered. The vibration of the voice created vibrations in the diaphragm, and consequently in the rays of light reflected from the mirror, and these shaped themselves into articulate sounds."

The Thomson-Houston System of Electric Lighting in Boston.

The Boston *Advertiser* celebrated its removal to new and enlarged quarters on Monday by issuing a twenty-page paper, containing a review of the principal business enterprises of Boston. From this we learn that the American Electric and Illuminating Company of that city, which uses the Thomson and Houston arc-light system, is making rapid progress. The company was incorporated last May, and began operations in September. It has now 200 lights in use in Boston, with contracts for 100 more. The central lighting station is situated in the basement of the Massachusetts Charitable Mechanic Institute, on Huntington avenue. The motive power is communicated to the dynamos by means of a one hundred and fifty horse power Wheelock engine, two fifty horse power Lawrence engines, two rotary Wing engines, one of thirty and one of one hundred horse power. The last named engines are the first of the kind ever made or used for this purpose, which will work with a direct attachment to the dynamo. The total lighting capacity of the present central station of the company is about 1,000 lamps, of 2,000 candle power each. There are about ninety towns and cities in New England now dependent entirely upon gas, for which the company has already procured a number of charters, and it is intended to establish sub-companies throughout the New England States as rapidly as possible. The total number of arc lights in use in the United States is said by the *Advertiser* to be over 75,000.

Frictional Electricity in the Press Room.

We looked into the press room of one of Boston's large printing establishments this week. The foreman was furious and the proprietor sorrowful. Frictional electricity in the printed sheets of paper as they left the presses was the immediate cause of their trouble. It is an interesting and not uncommon phenomenon, and is not easily explained nor easily controlled. It has puzzled Profs. Bell and Wadman, and the best electricians we have about here. The packing upon the press cylinder seems to act as an inductor, and the paper leaves the press thoroughly electrofied. We watched a press running of 1,700 per hour. Suddenly the printed sheet clung about the cylinder as though pasted upon it, and had to be torn off in strips. Again, we lifted a few freshly printed leaves, and they ripped and crackled like the stitches in an old coat. Then we saw a lot of cardboard being printed. The sheets stuck together as solid as a brick, and could not be separated until the electricity had partly passed off. A piece of printers' brass rule placed in this pile of cardboard, with an end projecting, threw off sparks when approached within an inch by another piece of rule. Two sheets sucked together when held fourteen inches apart. Wet rags placed around the delivery table and led into a bucket of water charged the water with electricity in forty minutes so that a positive shock was felt upon a hand being immersed in the pail. Electrical currents were felt in the hands and arms upon handling a pile of paper eight minutes after being printed. The bother to the printer is a considerable one. It entails inconvenience and a serious loss. Valuable work is frequently spoiled by the electricity packing the leaves so closely as to offset the fresh ink. Then the presses have to be slow-speeded with frequent stoppages. Nothing so demoralizes the pressman as the mystery of frictional electricity when under full headway.

Electric Bicycles.

Electricity has long been threatening to displace gas as an illuminant. It is now entering the field against the horse as a means of traction. Two eminent electricians claim to be able to bottle up twelve horse power in a storage battery weighing three hundred weight, and they promise to produce in a few months a perfectly practical electric tricycle, capable of running fifteen or twenty miles without recharging the accumulators, and able to ascend all such hills as are now possible for the foot tricycle, and even steeper gradients if auxiliary foot gearing be used to help the electro-motor when the incline is great.

The weight of batteries will not exceed the weight of a second rider, and it will run at the rate of seven miles an hour. As the new motor will never go lame, or shy, or break its knees, or eat its head off when not employed, it is likely to prove a dangerous rival to the horse. The quadruped, however, which has survived steam need not fear extinction by electricity.—*Pall Mall Gazette.*

Mr. William Baxter, inventor of the celebrated Baxter engine, who has lately completed a contract for lighting certain streets in Jersey City, N. J., states:

"We are running 56 lights (one 20 and two 18-light dynamos). These are driven by a Baxter automatic cut-off vertical engine, 12 x 12 cylinder, 240 revolutions per minute, 70 lbs. steam, cutting off at one-fourth stroke. The consumption of coal is less than two lbs. per hour per light, the latter being the Fuller electrical company's standard lights of 2,000 candle power each. We are using ordinary anthracite coal, costing $4.60 per ton delivered in Jersey City. The above consumption of fuel includes also the heating by steam of the building (26 x 100 feet) in which the apparatus is placed. The building is constructed of wood."

NEW PATENTS—ELECTRICAL—1883.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING FEBRUARY 23d, 1883.

271,169 Electric induction machine; Addison G. Waterhouse, New York.
271,172 Electric light; Edward Weston, Newark, N. J.
271,042 Electric locomotive; Charles G. Curtis and Francis B. Crocker, New York.
271,175 Electromotor; Schuyler S. Wheeler, Charles G. Curtis and Francis B. Crocker, New York.
271,171 Incandescent electric lamp; Edward Weston, Newark, N. J.
271,029 Lightning conductor; Willian Brown, Duncannon, Pa.
271,059 Magazine electric lamp; Alenza T. Gifford, Providence, R. I.
270,990 Multiplex telegraphy; Charles Seldon, Toledo, O,
270,907 Optical attachment for printing telegraphs; Wm. J. McCausland, Philadelphia, Pa.
271,168 Receiver for telephones; Samuel H. Bartlett and Henry E. Waite, New York.

WEEK ENDING FEB. 2, 1883.

271,598 Automatic testing apparatus for telegraphic fire-alarm stations, George F. Bulen, Jersey City, N. J.
271,783 Automatic fire-extinguishing and alarm system, Charles E. Buell, New Haven, Conn.
271,999 Automatic switch-stand, Oliver J. True, Port Clinton, and Henry H. Houghton, Elyria, O.
271,610 Circuit closer for telephone receivers, Edward C. Dean, Washington, D. C.
271,947 Commutator for dynamo-electric machines, Elihu Thomson, New Britain, Conn.
271,928 Dynamo and magneto-electric machine, Chas A. Seeley, New York, N. Y.
271,972 Dynamo-electric machine, William Baxter, Jr., Jersey City, N. J.
271,979 Dynamo-electric machine, Ebenezer Gordon, New York, N. Y.
271,991 Electric regulator and alarm for incubators, F. Roosebrook, Elmira, N. Y.
271,994 Electrical insulator, Demetrius M.Steward, Cincinnati, O.
271,004 Electric gas-lighting burner, Henry J. Warren, West Bridgewater, Mass.
271,707 Electric hotel annunciator and fire alarm, Albert T. Hess, Des Moines, Ia.
271,948 Electric current regulator, Elihu Thomson, New Britain, Conn.
271,832 Electrical conductor, Perry G. Gardner, Jr., J. W. Leroy and Giles K. Tinker, North Adams, Mass.
271,721 Electric brake-setting apparatus, Jesse B. Low, Pulaski, N. Y.
271,805 Electric gas-lighting burner, Charles H. Crockett, Boston, Mass.
271,816 Electric arc lamp, William L. Dudley, Covington, Ky.
271,882 Electro-magnetic car signal, John W. Marley, Chicago, Ill.
271,904 Electric mail conveyer, Eberhart Nicolaisen, New York, N. Y.
271,913 Electric switch-board, Thomas J. Perrin, Brooklyn, N. Y.
271,914 Electrical switch-board, Thomas J. Perrin, Brooklyn, N. Y.
271,825 Fastening for electric circuit wires, Henry G. Fiske, Springfield, Mass.
271,615 Governor for dynamo-electric machines, Thomas A. Edison, Menlo Park, N. Y.
271,992 Galvanic battery, Abner M. Rosebrugh, Toronto, Ontario, Can.
271,613 Manufacture of incandescent electric lamps Thomas A. Edison, Menlo Park, N. J.
271,750 Manufacture of covered or insulated wire, Joseph D. Thomas, New York, N. Y.
271,903 Mouth-piece for telephone transmitters, Aaron S. Nichols, New Haven, Conn.
271,958 Railroad train telegraph, William T. Waters, Atlanta, Ga.
271,616 Regulator for dynamo-electric machine, Thomas A. Edison, Menlo Park, N. J.
271,654 Regulator for dynamo-electric machines, John F. Ott, Newark, N. J.
271,597 Station switch for fire telegraphs, George F. Bulen, Jersey City, N. J.
271,628 Secondary battery, Alfred Haid, Rahway, N. J.
271,732 Secondary battery, Charles Placide, Nezeraux, Paris, France.
271,880 Secondary battery, James A. Maloney, Washington, D. C.
271,733 Tripod standard for lighting rods, T. H. Pattee and T. D. Ridge, Greencastle, Ind.
271,878 Telephone, Charles T. Loring and G. W. Pierce, Boston, Mass.
271,924 Telephone transmitter, Edward A. Shoettel, Brooklyn, N. Y.

The American Iron and Steel Association officially announces that the quantity of pig iron made in the United States, in 1882, was 4,623,000 tons, which is most 500,000 tons more than was ever before made in one year in this country.

The Pennsylvania Railroad Company has tried the Brush arc light for illuminating its yard near the Union Depot, in Pittsburgh. The experiment proving successful, the company has recently added to the number of lamps.

Compared with 1874, Philadelphia shows an increase of 150,000 in population, and has 280 miles of paved streets more than it had at that time. There are also 55,000 more dwellings than there were then.

Business Notices.

The attention of persons interested in local telegraph and telephone organizations is respectfully called to the electric lighting system of The Fuller Electrical Company; and the practicability of making arrangements with that company for the introduction of its apparatus, either in isolated plants, or through the formation of local companies des engage in the business of electric lighting. T ially valuable feature of this company's syste be seen by examination of its apparatus in Worcester, Providence, Hartford, New Yor Brooklyn, Jersey City, Paterson, Philadelphi caster, Scranton, Syracuse, Rochester, Buffal burgh, Wheeling, Steubenville, Xenia, Dayto Rapids, Chicago, Springfield, Belleville, St. St. Paul, and many other smaller places thr the country. Correspondence is invited.

THE FULLER ELECTRICAL COMPANY
44 East 14th Street, New York

A Dictionary of Electricity, by Henry G Y., Agent College of Electrical Engineeri East 26th street, New York. Octavo, $2.0 fessor Edison says of it: "It is exceeding able to all interested in electrical science. out the old glass machine, sealing-wax, an periments, &c., &c., and inserting cuts and tions of the recent wonderful inventions, r exceptionally interesting to electricians an raphers. Nearly every electrical invent manufacturer in the world will find a descri their invention or apparatus in it."

Storage of Electrical Energy, by Henry G Y., Agent College of Electrical Engineering. binding, 50 cents. One of the latest and be cations on this interesting subject.